PULP & PAPER

November 1983

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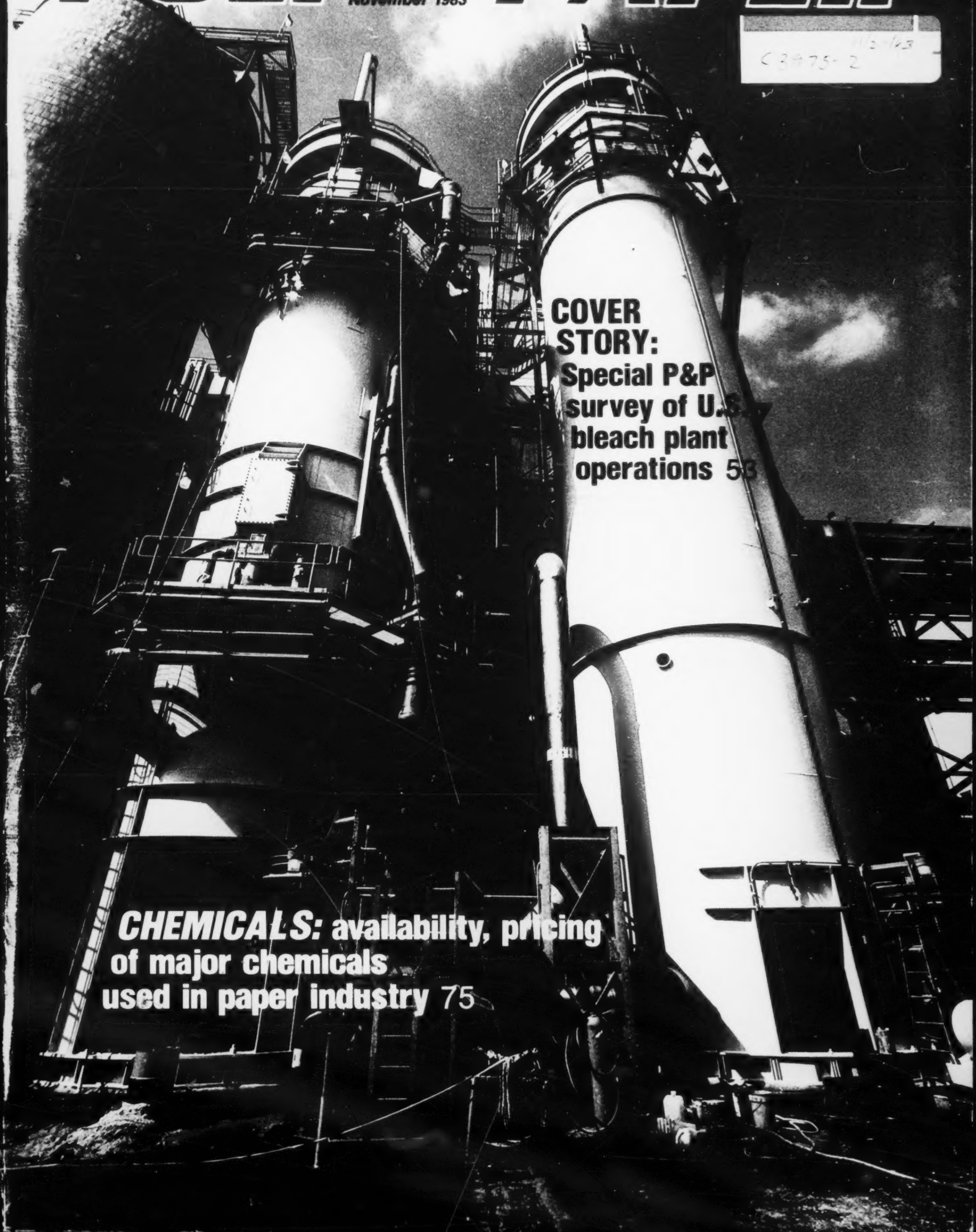


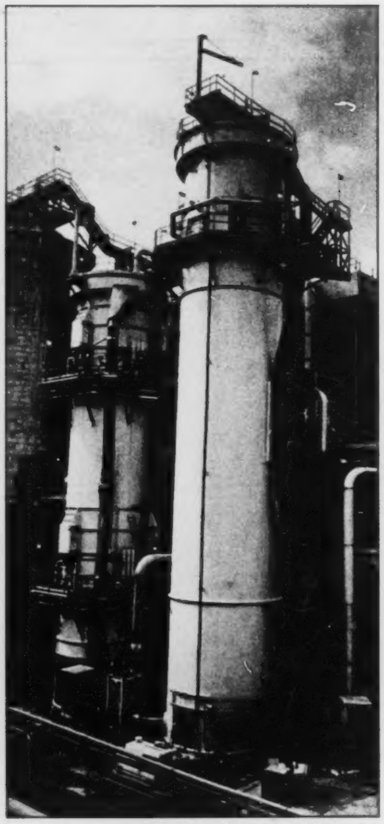
COVER STORY: Special P&P survey of U.S. bleach plant operations 53

CHEMICALS: **availability, pricing of major chemicals used in paper industry** 75

PULP&PAPER

Volume 57 Number 11 November 1983

CHEMICAL REPORT 75



BLEACHING SURVEY 53

COVER: *State-of-the-art in bleaching, a special highlight in this issue, is exemplified by Crown Zellerbach's new displacement bleaching tower at Camas, Wash. (Photo by Ralph Perry courtesy of Crown Zellerbach).*

ISSUE FOCUS: **CHEMICALS**

58 **Onsite ClO_2 production** has become more practical with the development and perfection of membrane electrolytic cells

75 **Chemical supply and demand:** annual survey finds demand for most chemicals up as industry performance improves; few shortages reported. Survey details demand, sources, availability, pricing, and forecasts

ISSUE FOCUS: **BLEACHING**

53 **COVER STORY: Exclusive *P&P* survey** of U.S. bleach plant operations: sequences, equipment, chemical use, and new technology

122 **Oxygen bleaching mill expands:** Eddy Forest Products ups softwood, hardwood pulp capacity to 1,000 tpd at Espanola, Ont., mill—pioneer facility for O_2-bleached softwood kraft pulps in North America since 1977

Mill operations

103 **Highest pressure industrial power boiler in U.S.** online at Union Camp, Savannah, Ga., generates 800,000 lb/hour steam at 1,850 psi

119 **State-of-the-art woodyard in full operation** at Scott, Mobile, Ala.; longwood barged from remote yards now being processed onsite

142 **Optimizing ring crush tests** requires a different strategy in pulp and paper mill operations than achieving maximum mullen

148 **Jackson Paper starts up** rebuilt corrugated medium machine at former Mead mill in Sylva, N.C.; the company plans to make 200 tpd

Engineering/Maintenance

62 **Quick-install fiberglass insulation** used on high pressure steam lines helps southern kraft mill meet stringent construction schedule

126 **Dryer system design important** in determining fuel usage, efficiency

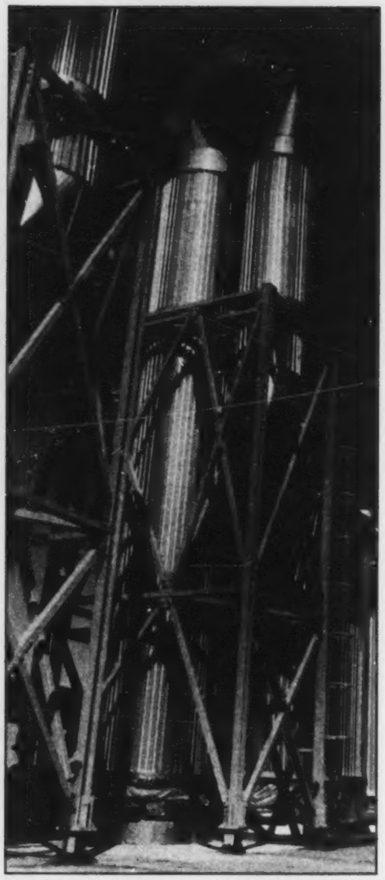
Process automation

98 **Transmitter maintenance pays off** at Boise Cascade; new boiler runs on automatic with no major equipment failures since startup

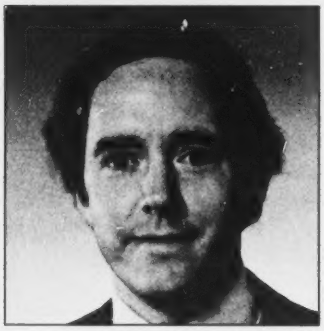
100 **Microprocessor-based process transmitter** designed to reduce startup and maintenance costs; unit can be remotely calibrated

102 **Computerized scaling system** at Hiwassee Land Co. reduces log and chip truck turnaround time and pays contractors automatically

Table of contents continued on page 5



CON-BATH'S NEW DRYING TOWERS 25



SIBBERNSEN ON LABOR 222

Management

146 **Forty-one runners helped raise more than $1,300** for the NCSU Pulp & Paper Foundation at the First Annual Paper Chase 5-K run in Dallas

News

9 **News Summary** —This month's news, including People, Supplier News
11 **Month in Statistics** —U.S. paper and paperboard production
13 **Marketing Roundup** —Newsprint stocks rise—strike fears; SC papermaker tests the water; boxboard price hike being accepted
21 **News Roundup** —L-P employees may acquire Ketchikan unit; St. Regis/Tenma explore joint venture; mediator to be named in B.C. deadlock; labor disputes settled at CCA mills; FAO survey sees slowdown for 1982-87
39 **International News—** Obbola may up capacity with rebuild; Japan plans to slash capacity 10.6%; Argentine group faces debt woes
41 **Regulatory Roundup** —EPA proposals may net industry boilers; partial victory on nonpoint water; Reagan won't back unitary tax change

Columns

7 **Editors' Notebook** —What's new in bleaching; chemical availability and pricing; salary survey report next issue
43 **Washington Viewpoint** —Treatment for its own sake
163 **Career Development** —Increasing your department's productivity
175 **Maintenance Tips** —Boiler tube protection, vent silencers
222 **Industry Comment** —Labor relations—vision for improvement

Departments

45 **Conference Calendar**
165 **News of People**
187 **Product Showcase**
189 **New Products**
200 **Product Review**
201 **Current Literature**
207 **Book Shelf**
207 **Letters to the Editor**
208 **Supplier News**

Services

177 **Readers Service Index**
179 **Readers Service Card**
210 **Professional Service Directory**
212 **Jobs Wanted**
213 **Classified Advertising**
220 **Advertisers Index**

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ABP BPA

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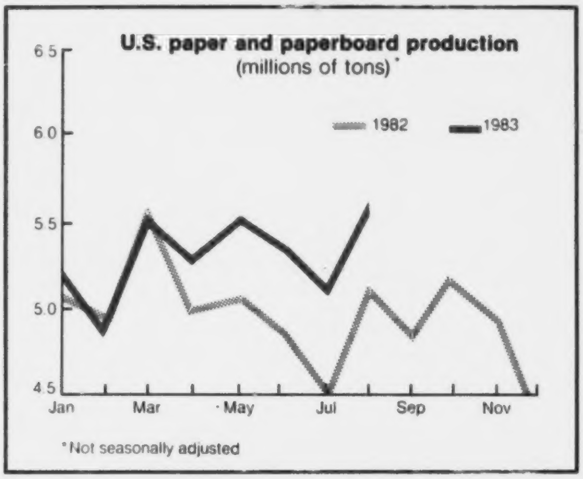
MONTH IN STATISTICS

U.S. paper and paperboard production totaled 5.618 million tons in August, the first time the monthly total has moved above 5.6 million tons, according to the American Paper Institute. The August total was up 9.4% from August 1982. The July-August two-month moving average of seasonally adjusted data stood at 65.1 million tpy, down slightly from the July level of 65.3 million tpy. Total paper and paperboard production through August averaged 63.2 million tpy, up 6.9% from 1982.

Among major grades, printing and writing paper grades for the first eight months surpassed the 17-million-tpy mark for the first time, with production through August up 9.4% from a year earlier. Newsprint recovered somewhat in August, returning to its 1982 level. Paperboard production through August was up 7.3% from last year, with containerboard up 9.2%. Corrugated box shipments through August were up 6.0% from 1982 levels, according to the Fibre Box Assn.

Canadian newsprint shipments totaled 696,000 metric tons in August, up 16.5% from August 1982, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates stood at 86% compared with 75% last August.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	August	458	11.7	5,150	0.1
Uncoated groundwood (s)	August	128	−1.5	1,467	2.3
Coated paper (s)	August	503	15.1	5,520	10.8
Uncoated free sheet (s)	August	756	16.3	8,604	10.0
Unbleached kraft packaging and industrial (s)	August	348	6.7	3,754	2.6
Tissue	August	390	5.4	4,692	6.6
Total paper	**August**	**2,872**	**10.8**	**32,392**	**6.6**
Kraft linerboard, unbleached	August	1,305	8.2	14,836	9.2
Semichemical medium	August	406	16.3	4,665	5.8
Bleached paperboard	August	327	3.5	3,890	3.1
Recycled paperboard	August	620	8.4	7,111	8.2
Total paperboard	**August**	**2,747**	**8.0**	**31,593**	**7.3**
Total paper and paperboard*	**August**	**5,618**	**9.4**	**63,985**	**6.9**
PULP, WASTEPAPER & FIBER [2]					
Total woodpulp production	July	4,114	10.2	51,840	3.6
Market pulp production	July	495	29.6	6,369	8.9
Wastepaper consumption at paper/board mills	July	1,128	9.2	14,146	5.5
Pulpwood consumption (cords)	July	6,801	0.9	84,518	7.1
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	August	22,649	10.7	166,104†	6.0
Containerboard inventories at box plants	August 1	2,486	−6.1		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	July	702	20.0	8,594	8.1
Imports of Canadian newsprint	July	535	19.1	6,676†	1.3
U.S. paper exports (including products)	July	412	15.4	4,611	7.3
Exports of unbleached kraft linerboard	August	190	11.8	2,223	11.8
Exports of woodpulp	July	259	−0.8	3,560	1.4
CANADIAN STATISTICS [4] (reported in metric tons)					
Total newsprint shipments	August	696	16.5	5,451†	1.8
Operating rates	August	86%	75%	83%	85%
Inventories held by U.S. consumers	August 31	1,322	−12.0		
Woodpulp shipments (export only)	August	618	26.4	4,384†	11.6
Operating rates	August	90%	72%	83%	81%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Equity financing running at record pace

Equity financing activity in the forest product industry proceeded at a record pace during the first eight months of 1983, with 15 separate transactions raising a total of $917 million, according to analysts Thomas P. Clephane and Jeanne Carroll of Morgan Stanley & Co.

"The range of equity-linked financings was striking, with seven common-stock sales securing $524 million, four convertible exchangeable preferred issues totaling $290 million, three convertible debt deals amounting to $75 million, and one debt/equity swap," they noted. The financing deals ranged in size from $154 million for Weyerhaeuser and $121 million for Scott Paper to $14 million for Pentair and included two $100-million issues of convertible exchangeable preferred by St. Regis and Boise Cascade.

The analysts predicted that "receptivity of the capital markets, combined with improving prospects for economic growth in 1984, will encourage further equity-linked offerings by other forest products and paper companies."

- Clephane and Carroll also commented on the apparent success of Sir James Goldsmith in liquidating Diamond International assets.

Goldsmith acquired 100% of Diamond's stock in five stages from 1979 through 1982 for a total of $658 million. Six different Diamond manufacturing operations have already been sold in separate transactions, with cash proceeds from the sales totaling $440 million. These divestitures included the tissue/white paper mills sold to James River for $170 million and the recycled paperboard and converting operations sold to Jefferson Smurfit for $80 million.

In addition, Travelers Insurance in August granted an option to the Goldsmith interests to sell the insurance company 657,000 acres of western timberland. If the option is exercised within three years, Diamond would receive $250 million in cash. In addition, Diamond recently completed the sale of its retail building products division to Michigan General Corp. for $120 million. Diamond also has 892,000 acres of Northeast timberland, mostly located in Maine, which is up for possible sale.

"The Diamond transactions are interesting because Sir James stands to realize proceeds estimated at $1.024 billion, or a pretax profit of $366 million above his acquisition cost of $658 million, before repayment of $55 million in pro forma long-term debt," according to the Morgan Stanley analysts. And Goldsmith could sell the western timberlands—which have an estimated fair-market value of more than $800 million—to another party for a much higher price.

1983 equity and equity-linked financings in the paper and forest products industry

Company	Type of security	Amount sold (millions of $)	Date
James River	Common stock	$ 83	1/11/83
Boise Cascade	Conv. Exch. PS	100	1/21/83
Great Northern	Conv. Exch. PS	40	2/25/83
Southwest Forest	Conv. Sub. Debs.	40	3/17/83
Stone Container	Common stock	39	3/23/83
Crown Zellerbach	Conv. Exch. PS	50	4/7/83
Mead	Common stock (debt/equity swap)	28	4/8/83
Weyerhaeuser	Common stock	154	4/14/83
Hammermill	Conv. Sub. notes	25	4/30/83
Scott Paper	Common stock	121	5/24/83
St. Regis	Conv. Exch. PS	100	6/30/83
Southwest Forest	Conv. Sub. Debs.	10	7/5/83
Masonite	Common stock	38	7/11/83
Pentair	Common stock	14	7/11/83
James River	Common stock	75	8/11/83
Total		**917**	

Conv.=convertible; Exch.=exchangeable; PS=preferred stock; Sub.=subordinated; Debs.=debentures.
Source: Morgan Stanley & Co.

ACQUISITIONS

PCA to buy Diamond molded pulp plants

Packaging Corp. of America announced that it has acquired some of the domestic and foreign assets of Diamond International Corp.'s molded fiber products division for an undisclosed amount.

The domestic assets being purchased include molded pulp plants in Red Bluff, Calif., and Plattsburgh, N.Y., a research center in Portland, Maine, and an idle plant in Middletown, Ohio. PCA has no immediate plans to reopen the Middletown plant, it said. PCA also has an option to acquire Diamond's molded pulp plant at Palmer, Mass.

Foreign operations purchased by PCA include Omni-Pac GmbH of Elsfleth, West Germany, with sales offices in several European countries, and Hartmann Fibre Ltd. of Great Yarmouth, England.

PCA previously had two molded pulp plants in the U.S., in Macon, Ga., and Griffith, Ind.

EXPANSIONS

St. Regis/Tenma explore joint venture

St. Regis Corp. and Tenma Paper Mills & Co. are "exploring" a joint venture to produce bleached paperboard. The project would use a portion of St. Regis's kraft mill near Pensacola, Fla., which is scheduled for permanent shutdown. Production would be exported by Tenma to Japan.

The proposed venture would revitalize portions of the 250-tpd No. 1 mill at Pensacola, which houses two machines. One of the machines, a 106-in.-wide cylinder unit, was shut down in 1982 and is currently for sale.

The other 144-in.-trim machine is scheduled for closure later this year, once the $17-million conversion of No. 3 machine from production of unbleached kraft paper to 400 tpd of both bleached and unbleached grades is completed. No. 3 machine is located in the newer No. 2 mill, which also houses an unbleached kraft paper machine and the new 665-tpd Stress Kraft paper machine installed in 1981 as part of a massive $250-million mill modernization.

It will take at least six months and possibly two years before Tenma decides if the project is feasible, the company's U.S. representative, Leo E. Weckerle, told a local paper.

MARKETS

Strong U.S. dollar hurts pulp prices. . .

Hopes for a large fourth-quarter market pulp price increase in Europe vanished in September with Canadian and Scandinavian producers announcing an unchanged $440/metric-ton price for northern bleached softwood kraft. Southern U.S. producers, however, did manage to lift list prices for pine by $20/ton to $420 and mixed hardwood by $10 to $395, although several producers were forced to scuttle earlier announced plans for $40/ton increases on these grades.

The size of the increase was a big disappointment to Canadian and U.S. producers, most of whom have been operating at a loss. But there was considerable resistance to higher prices from European buyers, who had already seen their pulp prices rise by 18% to 25% this year, mostly due to the strong U.S. dollar. And Scandinavian suppliers had little incentive to lead a price increase since they have been profitable at recent price levels due to devalued currencies. Producer pulp inventories at the end of August of 1.63 million metric tons were also relatively high, with most of the excess concentrated in softwood grades.

Producers now are concentrating on bringing up NBSK transaction prices to actual list levels, which in the third quarter were averaging about $420/metric ton in northern Europe. This would amount to a $20/ton price increase and set the stage for a first-quarter price hike, especially if the weakening trend in the dollar begun in August continues.

Domestic increase. NBSK prices in the domestic U.S. market are also remaining unchanged at the $450/metric-ton level for the fourth quarter. Northern hardwood, however, is being increased by $20/ton to $420, while southern grades are rising $25/ton to $425 for pine and $400 for mixed hardwoods, with customers reportedly accepting the hike.

But the situation could change dramatically with any industry-wide strike in British Columbia longer than a month.

Strong U.S. dollar has caused cost of NBSK to rise in major buying currencies . . .
(per metric ton, c.i.f.)

	9/1/83	% change from 1/1/83	1/1/83	% change from 1/1/82*
U.S.$ price	430	+ 4.9%	410	−24.8%
In buyers' currencies				
France (franc)	3,472	+25.8	2,759	−11.0
Italy (lira)	688,860	+22.9	560,470	−13.8
W. Germany (mark)	1,152	+18.0	976	−24.7
U.K. (pound)	288	+13.4	254	−24.4
Japan (yen)	105,608	+10.1	95,940	−24.8

...and given Nordic producers a big cost advantage

	9/1/83	% change from 1/1/83	1/1/83	% change from 1/1/82*
In sellers' currencies				
Canada (C$)	529	+4.5	506	−21.7
Finland (markka)	2,468	+14.0	2,165	−8.9
Sweden (krona)	3,401	+13.9	2,985	−1.6

*Percent change based on $545 list price in effect at the beginning of 1982.

. . . and linerboard in overseas markets

U.S. linerboard producers are now hoping for a Jan. 1 price increase in northern Europe, where no move was set for the fourth quarter despite the success of the recent $20/short-ton increase in the U.S. The new eastern U.S. price of $290/short ton corresponds to a c.i.f. price in northern Europe of about $380/metric ton for heavyweight board.

The official fourth-quarter European price, however, will remain at the $333/metric-ton "minimum" price established by the EEC last spring—which represents about the maximum price currently being paid.

Industry observers say that so far linerboard demand in Europe has been "cautious" coming off the long summer lull. Domestic test liner in some countries is reported to be selling 20% to 30% below imported kraft linerboard. There has also been keen competition from Scandinavian, Portuguese and Brazilian producers who are benefiting from weak currencies and who have the advantage of lower or no duty. Meanwhile, French customs authorities were reportedly investigating sales below the minimum price level.

Asian market. In Southeast Asia, regular U.S. suppliers in September implemented about a $30/metric-ton price increase, which brings the general price level in this region to around $345/ton c.i.f., although spot discounting persists. However, prices in this region—a dumping ground during the recession—still have a long way to go before returning to their prerecession peak of around $460/metric ton.

Orders from the two largest Far East importing countries have picked up strongly this year, with first-half 1983 shipments up 44% to Japan and 139% to the People's Republic of China compared to a year ago.

U.S. unbleached kraft linerboard exports for the first six months of 1983 to selected major importing countries

Country	Quantity (short tons)	% change from '82	Value ($000)	$ change from '82
United Kingdom	143,176	+14.9%	$ 38,222	+1.4%
Fed. Rep. Ger.	57,062	−31.9	15,015	−38.3
Italy	74,532	+40.0	17,306	+9.2
Netherlands	20.086	−14.7	5,124	−31.4
France	18,362	+28.6	4,705	+11.8
Japan	77,379	+44.1	21,834	+28.7
China (PRC)	80,219	+139.0	14,843	+94.0
Hong Kong	44,273	+133.5	9,627	+55.2
Philippines	27,446	−44.2	5,882	−59.9
Costa Rica	40,727	−4.6	9,254	−19.2
Panama	34,561	+13.6	7,337	+0.9
Honduras	29,691	−11.3	6,771	+21.7
Colombia	27,748	+21.2	6,618	+2.2
Ecuador	18,793	−17.4	5,241	−29.5
Israel	26,625	−2.8	6,902	−18.4
Nigeria	9,413	−34.9	2,156	−46.8
Total*	1,042,139	+16.3	250,793	−6.5

*All countries, including those not listed.
Source: U.S. Dept. of Commerce.

WORLD CAPACITY

FAO survey sees slowdown for 1982-87

Worldwide capacity for paper pulp production will rise from 156.5 million metric tons in 1982 to 168.5 million tons by 1987, according to the United Nations' Food & Agriculture Organization in its *Pulp & Paper Capacities 1982-1987*. The increase represents an annual growth rate of 1.5%, compared with 1.9% for the previous five-year period. World paper and paperboard capacity will grow from 208.4 million tons in 1982 to 226.8 million tons by 1987, the report estimates, a rate of 1.8%/year, down from an annual rate of 2.6% in the year-earlier report.

Some 77% of world paper and board capacity in 1982 was in what the FAO terms "developed market economies," 9% in "developing" countries, and 14% in "centrally planned" economies.

Paper grades. World capacity for newsprint and printing/writing papers is expected to grow at an annual rate of 2.3% from 1982 to 1987, with other paper and paperboard grades pegged at 1.3%. Growth of capacity in developing market countries is estimated at 3.6%.

Newsprint capacity of 31.2 million tons in 1982 is expected to increase by 3.7 million tons to 34.9 million tons by 1987. Printing/writing grades should rise by 6.1 million tons from 51.6 million tons in 1982 to 57.7 million tons by 1987.

Other paper and board grades were reported at 125.6 million tons of capacity in 1982, and these grades are now estimated to reach 134.2 million tons of capacity by 1987. This is a substantially slower growth rate than had been previously expected.

Pulp. Chemical pulp represents 63% of total pulp in the FAO survey, and it will reach 106.3 million tons by 1987, adding 7.1 million tons in the five-year period. Thermomechanical pulp is expected to reach 11.2 million tons by 1987, an addition of 3.0 million tons. For other mechanical pulp grades, a decrease of 0.6 million tons in the developed market countries results in a worldwide increase of only 0.3 million tons in 1982-87.

The apparent ratio of paper pulp to paper production continues downward, reports FAO, falling to 75% in 1982 and to 74% by 1987.

World woodpulp capacity, 1982-87

	Capacity (000 metric tons)		Annual average increase	
	1982	1987	1977-82	1982-87
World total	144,922	155,947	1.8	1.6
Developed economies	118,679	125,849	1.0	1.2
North America	72,392	76,181	1.7	1.0
Japan	12,291	12,694	0.8	0.6
Western Europe	30,805	33,018	−0.4	1.4
Oceania	2,411	2,730	2.7	2.5
Others	780	1,226	0.1	9.4
Developing economies	7,990	10,437	7.6	5.5
Africa	687	904	15.8	5.7
Latin America	5,596	7,406	6.4	5.7
Asia	1,707	2,127	9.2	4.6
Centrally planned economies	18,253	19,661	3.7	1.6
Asia	2,896	3,150	4.4	1.8
Eastern Europe	4,107	4,461	2.7	1.7
U.S.S.R.	11,250	12,050	4.1	1.4

World paper and paperboard capacity, 1982-87

	Capacity (000 metric tons)		Annual average increase	
	1982	1987	1977-82	1982-87
World total	208,428	226,823	2.5	1.8
Developed economies	161,012	173,836	1.8	1.6
North America	80,785	85,818	1.9	1.2
Japan	22,849	25,315	1.9	2.1
Western Europe	53,260	57,390	1.6	1.6
Oceania	2,525	3,316	2.7	5.5
Others	1,593	1,997	4.6	4.6
Developing economies	18,278	21,838	7.6	3.6
Africa	886	1,240	6.4	7.0
Latin America	10,257	12,449	6.0	3.9
Asia	7,135	8,149	10.9	2.7
Centrally planned economies	29,138	31,149	3.4	1.4
Asia	9,734	10,284	2.8	1.2
Eastern Europe	6,404	6,865	2.1	1.4
U.S.S.R.	13,000	14,000	4.4	1.6

Source: FAO Pulp & Paper Capacities 1982-1987

WOOD PRODUCTS

L-P ends talks to buy Diamond plants

Louisiana-Pacific Corp. has ended a previously planned acquisition of Diamond International Corp.'s wood products facilities because the companies could not work out "an acceptable timber supply contract." The facilities which would have been acquired included eight sawmills in California, Idaho, Montana and Oregon and two plywood and two millwork plants in Oregon and California.

- In the meantime, **Michigan General Corp.** has reportedly completed the acquisition of Diamond International's retail lumber and building products division for approximately $120 million.
- **Georgia Kraft Co.** plans to construct a new lumber mill with an annual capacity of 67 million bd ft at Cottonton, Ala. The decision to build the mill was based on commitments made by the states of Alabama and Georgia to build a bridge over the Chattahoochee River near the proposed facility.
- **Trus Joist Corp.** has acquired an option from Willamette Industries to purchase an idle plywood plant on a 69-acre site in Natchitoches, La. Trus Joist would use the plant to make laminated-veneer lumber, a high-strength lumber now produced only on the West Coast. The plant could reopen by the end of 1984.
- **Chesapeake Corp. of Virginia** plans to build a wood-preservative plant on a site being purchased in the Bethlehem-Easton area of Pennsylvania. The $1.5-million plant, Chesapeake's third such facility, is scheduled to start up in January 1984.
- **Bohemia Inc.** has permanently shut down its Junction City, Ore., plywood plant, idle since October 1981, and its Brownsville, Ore., lumber mill.

FORECAST

Woodpulp consumption seen rising

World cellulose fiber consumption should rise at a 3.6%/year rate through 1985, slowing to 3.2% between 1985 and 1995, compared to a historic rate of 3.0%, according to a recent study by Predicasts Inc. Total fiber consumption is projected to reach 288 million tons in 1995, up from 183 million tons in 1981.

"This will be the result of a more favorable outlook for paper and paperboard production," the study said, with improving economic growth and major adjustments to lower basis weights and other conservation measures largely completed in the 1970s.

"The increasing demand in cellulose fibrous pulp is anticipated to place substantial pressure on forest resources in the world," according to the Cleveland, Ohio-based market research firm.

Only North America, Scandinavia, South America, the U.S.S.R. and central Africa possess enormous forest resources. But significant increases in forest yield are impossible in Scandinavia, while timber utilization in South America, the U.S.S.R. and Africa is held back by lack of infrastructure—leaving Canada and the southern U.S. with "the best potential in supplying the world's fiber needs," according to analyst Eunice Lee.

Smaller share for woodpulp. As a result, the share of woodpulp in total fiber consumption is projected to decline further, with increasing use of wastepaper and other fibers.

Total woodpulp consumption is projected to hit 183 million tons in 1995, up from 125 million tons in 1981, with Canada, Japan, the U.S.S.R., Finland and Sweden the largest producers and consumers. Consumption is seen up 3.1%/year in the 1981-85 period and 2.6%/year from 1985 to 1995 vs a historic rate of 2.3%.

The European Economic Community will face the most serious pulp production deficit due to insufficient timber resources, and it will become increasingly dependent on Canadian and Scandinavian imports. Brazil and the U.S.S.R. will join these countries as major exporters, although intensifying eastern European pulp requirements will prevent the U.S.S.R. from playing a major role in world markets. Pulp demand will escalate most rapidly in the developing countries of Latin America, Africa, and Asia, which lack the means to exploit their large timber resources due to transportation, infrastructure and capital supply problems, according to *World Woodpulp & Other Fibrous Materials*.

World Cellulose Fibrous Pulp Supply & Demand
(000 metric tons)

	1981	1985	1995
Paper & board production	172,241	200,880	282,000
Fiber/p&b output (ratio)	1.06	1.05	1.02
Total fiber consumption	183,324	211,120	288,490
Woodpulp consumption	124,928	141,060	182,850
% of total fiber	68.1	66.8	63.4
Wastepaper consumption	48,659	58,190	88,225
& of total fiber	26.5	27.6	30.6
Other fiber consumption	9,737	11,870	17,415
% of total fiber	5.3	5.6	6.0

Source: Predicasts Inc.

Wastepaper growth. Wastepaper consumption is projected to rise from 48.7 million tons in 1981 to 88.2 million tons in 1995, accounting for 30.6% of total fiber consumption compared to 26.5% in 1981. Improved recovery techniques and a shortage of indigenous forest resources will spur wastepaper recovery and consumption through 1995, particularly in Japan and the EEC.

EXPORTS

EEC resumes newsprint quota talks . . .

Negotiations resumed on Sept. 27-28 in Ottawa, Ont., on proposed cuts in the level of tariff-free newsprint allowed into European Economic Community countries from non-EEC suppliers (*P&P*, Oct., p. 33).

This latest set of meetings between Canadian and EEC officials was not expected to produce any final results, said a Canadian official. Although the EEC's Jan. 1, 1984 deadline for implementing the proposed changes is nearing, talks were expected to last at least several weeks, he said.

The EEC wants to reduce the quota—presently 1.5 million metric tons—next Jan. 1 because that is when the duty on Scandinavian newsprint will be eliminated. Canada and Scandinavia are the principal suppliers of newsprint to Europe from outside the EEC.

. . . and pulp price-fixing talks

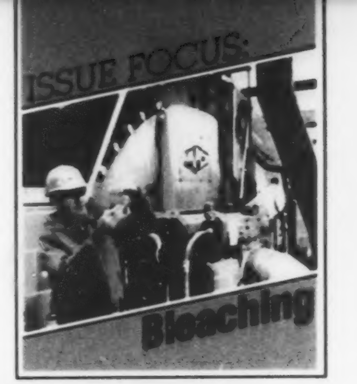
Meetings with some companies involved in the European Economic Community's investigation of alleged pulp price-fixing began early in September as the EEC resumed operations following its month-long holiday, observers said.

The meetings, which relate to a long-standing investigation into an alleged cartel involving 57 producers worldwide—including the U.S. and Canada—were said to be informal gatherings to discuss documents already submitted by the companies. Similiar meetings were held earlier this summer, said one official.

The EEC continues to request records on the companies' European pulp sales activities going back to 1974, observers said. The investigation appears to have nearly stalled, however, with little progress having been made, say officials.

The meetings and requests for additional data are likely to continue, said one company executive who expects to be asked for additional information within a short time. Companies generally feel a settlement in the near-term appears unlikely, and many suspect the EEC may be overwhelmed with documentation.

An EEC proposal made this spring for a possible settlement of the case has received mixed response from the companies, observers said. The EEC's plan involved changing the currency of exchange from the U.S. dollar in most cases. Nonintegrated producers could sell in either the currency of the buyer or the seller, however (*P&P*, June, p. 35).



Chemical pulp bleaching: survey of U.S. bleach plant operations

Pulp & Paper's exclusive survey of bleach plants covers data on chemical use, inroads of new technology, trends in bleach plant operation

By MICHAEL J. DUCEY

TABLE 1: **Breakdown of mills and bleach plants surveyed, grouped geographically and by process specifications.**

Total bleach plant lines	83
Total tonnage	15,704,000
Total bleached U.S. capacity	22,000,000
Capacity represented by survey (%)	71.4
Geographic distribution	
Region	**Number**
South	48
Northeast	14
West	8
Midwest	11
Process distribution	
Species processed	**Number of lines reporting**
Hardwood	46
Softwood	52
Blends	10
Number of stages in sequence	
3	12
4	26
5	35
6	15
End product	
Market pulp	51
Fine paper	28
Tissue	7
Paperboard	10
Bleached pulp capacity (tpd)	
700 and over	20
400 to 700	25
Below 700	29

Note: Some bleach plants may be counted more than once and thus add up to more than 83, since some mills produce more than one bleached grade—for example, both hardwood and softwood, using different sequences at the same site.

■ This article presents the results of an exclusive *Pulp & Paper* survey of bleached chemical pulp mills in the U.S. covering many aspects of bleach plant operations.

P&P began the survey in November 1982 by sending a detailed survey questionnaire to each bleached mill in the U.S. The survey form asked for bleach plant operating data (sequence, species, pulp, tpd, brightness, and end-use) and chemical usage within each sequence in lb/ton of pulp. As of mid-August, nearly 70% of all bleached chemical pulp produced, or about 15 million short tons, was accounted for (see Table 1).

This tonnage consists of bleached pulp processed by 83 bleach plant lines with a heavy concentration in the South. The capacity represented by the individual mill operations is spread relatively evenly, with 27% of the mills producing 700 tpd or more, 33% producing from 400 to 700 tpd, and 39% producing less than 400 tpd.

The majority of the mills responding to the survey produce market pulp, fine paper, and bleached board. A few mills also produce tissue grades. Mills producing bleached paperboard grades are well represented, but the percentage of the total tonnage responding to the survey in this grade is less than that represented by market pulp and fine paper producers who responded.

American Paper Institute capacity data for 1982 show that 21,119,000 tons of bleached/semibleached kraft and 1,372 tons of bleached sulfite, or a total of 22,491,000 tpd of capacity, are in place.

As a follow-up to the mailing, a telephone survey was conducted of all pulp mills in the U.S. More than 80 different locations provided detailed operating data, plans for expansion/modernization, areas that each particular mill was working on, and confidential information on the implementation of new technology. Only a few mills refused to release or verify any data on their operations. Some mills felt that their chemical usage data could be used by competitors to analyze cost structures, but in most cases these mills verified general trends and average usage on a chemical-by-chemical basis. As a result, the survey represents a very high per-

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centage of operating bleach plants in the U.S.

In most cases, chemical usage data presented here for each chemical indicate actual bleaching consumption. Although in some cases mills reported total chlorine use on a lb/ton pulp basis, including chlorine use for hypochlorite makeup, the chlorine-use data given here does not include that portion. Caustic soda was handled in a similar manner.

All survey information and data were processed using a personal computer for statistical analysis. Average chemical usage data in lb chemical/ton pulp are presented on a national and regional basis in Table 2.

Table 3 is a breakdown of chemical use segregated by intended end-use of the pulp. As noted above, the tonnage represented by board and tissue mills is less than 50% of total capacity for these grades. However, several producers who hesitated to release actual data confirmed that their average usage data was in most cases very similar to that reported by mills producing similar grades and using similar sequences.

Table 4 is a comparison of chemical use by the bleaching sequence employed.

In addition to gathering specific operating data covering chemical use, the survey also gathered information on mill expansions, new processes, etc. These findings are discussed below.

OXIDATIVE EXTRACTION. One new process receiving very strong interest at the mill level is oxidative extraction (E_O), which involves adding oxygen gas to the normal caustic extraction stage. About 30 mills reported that they are actively looking at installing this technology. Twenty-five mills indicated that they are currently investigating the use of oxygen on a laboratory/pilot basis, with a number planning to go online in 1984 if results are as anticipated and cost can be justified. The exact number of mills going with this process will be determined by how well certain limitations perceived by mill personnel are overcome. Cost justification of new equipment, particularly mixers, and determination of the best operating conditions, such as retention time, mixing techniques, etc., need to be resolved.

However, it is likely that a number of installations will be operating by the end of 1984. The main basis on which most E_O installations are justified is chemical cost savings, particularly of chlorine dioxide. However, data from initial installations indicate that chlorine and caustic use can also be adjusted and/or reduced.

Three methods of using oxygen with an extraction stage are currently online. The difference between these involve capital costs, mixing technique, and location of oxygen injection. The first method involves capital expenditure of between $100,000 and $500,000, depending on the existing system and the required results. This cost range covers mainly only the oxygen supply equipment on the low end and generally includes a mixer, thick stock pump, etc., on the high end.

In the first method—an upflow system—oxygen is injected with the pulp at a high-shear, medium-consistency mixer between the thick stock pump and the E_1 tower. Good mixing is required for uniform quality. Suppliers say that this mixing is necessary to avoid bubble coalescence, which causes channeling. In a downflow tower system an upflow retention tube is needed.

An upflow tube/downflow tower method is now online at Consolidated Papers Inc. in Wisconsin Rapids, Wis. The system is designed to handle around 425 tpd, the mill's entire output, and was brought online in September 1982. The system uses an Impco high-shear mixer and an Air Products & Chemicals oxygen supply system. A $2/ton savings in chemical cost, resulting in a one-year payback, has been reported by mill personnel. Some concern regarding fiber damage using the high-shear method has been voiced; however, the mills contacted have not experienced this. Other mills have installed high-shear E_O systems, including several Swedish mills and a Japanese mill. Also, sources indicate that another unidentified U.S. mill is currently operating this system.

The second method, online in two Japanese mills and one Canadian mill, involves a similar injection technique with a static mixer. Several sources indicate that low capital cost is one advantage of the static mixer.

The third method, now undergoing tests at more than a half dozen mills across the U.S., costs around $10,000. The O_2 is injected at the E_1 stage near the nozzles in the dilution zone of the tower. Additional mixing equipment, a high-cost item, is not necessary. Mixed reviews on this process have been reported. Some mills indicated problems resulting from improperly dissolved oxygen, but work on this method continues.

The O_2 addition rate varies with species, production rate, and method used, but generally falls between 6 to 10 lb/ton pulp on softwood and 4 to 6 lb/ton on hardwood. Addition rates in excess of about 15 lb/ton are seen as a limit. Retention times depend on production rate, but tests using 5 to 10 min with no real upper limit have proven effective. The Japanese mills using static mixing from Systematic report a 1:1.5 substitution of oxygen for chlorine dioxide. Final brightness is increased by a point or two using both mixing methods.

Reportedly, one side benefit of E_O is effluent reduction [biological oxygen demand (BOD), chemical oxygen demand (COD), color, and total suspended solids (TSS)] but no particular system to date has been shown better than others, and limited data are available. An added potential benefit could be obtained by lowering the amount of chlorine-containing chemical used; chlorine-containing organic compounds in the effluent should be reduced.

TABLE 2: **Average chemical usage data grouped geographically for comparison (lb/chemical ton pulp).**

	National		Regional							
			Northeast		South		West		Midwest	
Chemical	**Softwood**	**Hardwood**	**Softwood**	**Hardwood**	**Softwood**	**Hardwood**	**Softwood**	**Hardwood**	**Softwood**	**Hardwood**
Chlorine	115.9	90.4	130.7	75.3	116.6	78.4	115.4	N/A	N/A	98.3
Chlorine dioxide	20.6	19.3	15.5	13.4	24.2	20.3	20.3	N/A	N/A	18.3
Sodium hydroxide	82.7	69.5	56.5	45.4	86.8	65.6	99.4	N/A	N/A	83.3
Hypochlorite	45.0	36.6	51.3	33.9	38.5	28.2	88.4	N/A	N/A	54.7

CHLORINE DIOXIDE SUBSTITUTION. The large majority of U.S. mills surveyed that practice chlorine dioxide substitution in the chlorination stage have not moved toward higher levels (i.e., 40% to 70% substitution) despite the supposed advantages of doing so. Most mills feel that the lower levels (10% to 20%) are best since the primary goal of substitution is protection against viscosity loss. However, a handful of mills operate at levels of 20 to 30 lb/ton of ClO_2 in the C stage. The mills using lower levels generally report they see no advantage to the higher levels; although much published data indicate benefits through reduced chlorinated-compound-containing effluents. Around half the mills surveyed reported using ClO_2 in the C stage. These mills produce pulps for market and captive use, and for a variety of end-uses, including market pulp, solid bleached sulfate board grades, fine paper, and tissue.

DISPLACEMENT BLEACHING. Displacement bleaching, which was introduced to the U.S. by Kamyr in 1975 at Temple-Eastex Inc., has become more widely accepted recently with two new U.S. installations within the past year, bringing the total to four. The process technology has matured, and lower capital costs and equivalent chemical costs compared with a new five-stage conventional installation are now reported. Mechanical reliability has also reportedly improved, as the two original U.S. installations report no major shutdowns or problems. Worldwide displacement bleaching has grown tremendously, and recent modifications of the operation have proved successful.

The latest design reportedly requires more capital and space than earlier displacement versions, but offers brightness improvements. Medium-consistency chlorination using two-stage, high-shear mixing begins the process outside the tower. Chlorine dioxide and chlorine are injected into the first mixer (150 hp) perpendicular to the feedstock. The mixture is "twisted" into the second mixer, then pumped (by a thick stock pump) into the bottom of the tower. The pulp travels up through a series of displacement zones. Each zone has three steps: an initial dynamic period when chemical is absorbed into the pulp, a static period when fiber travels up to the next zone, and another dynamic period when liquid is displaced out of the suspension with washwater or liquid from the next zone in the sequence.

The production capability is determined largely by the size of the tower, usually associated with the number of concentric diffusion screens (or rings) constructed around a central rotating shaft. After the pulp from the displacement stage passes through a diffusion washer, it is taken to a conventional final D2 tower for three hours or so of retention. This design reportedly offers market pulp producers 90+ brightness capabilities and improved brightness stability.

Kamyr has also tested a larger tower, composed of a unit with seven rings which are 20 in. apart, that pushes production over 2,000 tpd. The two new American mills have smaller systems, according to industry sources. International Paper's mill at Georgetown, S.C., will operate a six-ring unit with production targeted at 1,220 tpd; however, ultimate capacity of this unit has been estimated at closer to 2,000 tpd. The new bleach plant will make Georgetown one of the largest bleached chemical pulp mills in the world. Crown Zellerbach at Camas, Wash., plans production with a five-ring unit at 800 tpd, expanding mill capacity there significantly. This system should be online in 1983. The latest order is from a 600-tpd mill in Japan.

The implementation of other new technology in conjunction with this system in Europe has already proved cost-effective. One method used in three mills is oxidative extraction. With a special nozzle, oxygen is introduced into the pulp close to the central shaft in the E1 mixing zone. When 5 to 7 lb/a.d. ton of oxygen are used, up to $2/ton can be saved in chemical costs. Problems can arise when oxygen bubbles recombine, but sources report that proper turbulence in the mixing zone ensures consistent pulp quality.

Displacement has always offered potentially large savings in energy costs and significant pollution reduction. With seven systems ordered in one year, it appears that displacement is headed for wide acceptance as the technology matures.

OXYGEN SYSTEMS. Giving displacement bleaching competition for new installations that deviate from conventional bleach plant technology are short-sequence processes that incorporate oxygen delignification. Other than those two relatively new processes, tests using alternate chemicals for short sequences (mainly ozone and peroxide) and other methods involving mixing in pipes and abbreviated retention times have been conducted. Much data have been published, but to date no commercial success has been achieved.

To date, three U.S. mills operate oxygen delignification systems, all of them at high consistency. The first was brought online at Chesapeake Corp. of Virginia's West Point, Va., mill in 1973, using an Impco system operating at 400 tpd. It was not until seven years later in

TABLE 3: **Average chemical usage segregated by end use of the pulp (lb/chemical ton pulp).**

	End-use of pulp					
	Market pulp		Fine paper			
Chemical	**Softwood**	**Hardwood**	**Softwood**	**Hardwood**	**Paperboard[1]**	**Tissue[1]**
Chlorine	99.4	72.9	120.5	92.7	120.6	90.0
Chlorine dioxide	25.5	21.9	17.5	16.1	15.6	12.3
Sodium hydroxide	74.8	62.8	81.1	69.2	84.9	57.5
Hypochlorite	29.1	25.8	53.5	41.7	54.5	34.3

1. Less than 50% of API capacity is actually represented based on data received from mills responding to the survey.

TABLE 4: **Comparison of chemical use by bleaching sequence used (lb/chemical ton pulp).**

	Sequence			
Chemical	**CEDED**	**CEHED**	**CEHDED**	**CEDH**
Chlorine	102.1	105.0	114.0	96.3
Chlorine dioxide	26.2	15.9	26.0	14.3
Sodium hypochlorite	79.8	86.2	87.2	48.5
Hypochlorite	—	36.7	36.0	32.0

Note: This breakdown does not consider end-use or final brightness and thus is not meant to be absolute.

1980 that Buckeye Cellulose brought a 1,000-tpd (design) Kamyr system online. The most recent startup was Union Camp's Franklin, Va., mill, with an Impco/Modo Chemetics system. Union Camp is also planning to install a similar system at its greenfield white pulp and paper complex in Eastover, S.C. In addition, various industry sources confirmed that at least one company is in the decision-making period regarding a new oxygen delignification system at an existing mill. Others are investigating these systems on a more preliminary basis.

The short-sequence process is typically three or four stages with the initial oxygen stage, primarily as a continuation of the pulping process. The stock is fed from the digester through a series of screens and washers to a press that prepares the pulp for high-consistency (28% to 33%) bleaching in an oxygen reactor. A thick-stock pump or screw feeder moves the stock to a fluffer on the top of the reactor, where it is dispersed evenly on the pulp bed. Steam can be applied here or with a steam mixer, depending on the particular system involved. Gaseous oxygen is injected into the bottom of the tower and moves through the pulp. After a 30- to 40-min retention, the pulp is diluted in the last reactor zone. Exit kappa number is about 10 for hardwood and 15 for softwood—about half of what it would be after a conventional C stage. The diluted pulp is blown into a tank for 20 to 30 min with agitation to remove entrained air. Two-stage washing then prepares the pulp for conventional bleaching in later stages. The spent liquor from the oxygen bleached pulp is sent to the kraft recovery system. The O_2 delignification reduces the bleach load on the later stages, due to its increased delignification, and results in chemical usage 25% to 35% lower than conventional sequences. Other major benefits reported are reduced BOD, COD, and TSS, all of which are reduced in excess of 50%. Energy consumption for oxygen systems seems to vary depending on exact conditions, and no conclusions were drawn from the survey.

The use of an O_2 stage to replace an existing intermediate stage such as hypochlorite is also in commercial use. The benefits are similar, but difficulty in installation can be encountered if space is a problem. However, one mill operates a full-scale system very successfully. Oxygen charges in all systems are typically between 27 to 35 lb/ton, and savings in chemical costs are reported close to $3/ton.

The relatively high cost of an oxygen system has historically been the major deterrent because the dewatering equipment raises the capital cost very high compared with a conventional bleach plant. On the positive side, the large decrease in bleach plant effluent favors oxygen in greenfield mills and in mills contemplating expansions where the effluent treatment system is running at capacity. In greenfield mills a smaller than normal treatment system can be installed, thus saving substantial amounts of capital in this area, which can be traded against the oxygen system's cost. In existing mills, expansion is possible while not increasing BOD, etc., as much as in a conventional bleaching operation, allowing mills to stay within effluent discharge limitations. Other benefits include heat value from the filtrate sent to the recovery system, provided the evaporator/recovery boiler can handle the additional load.

Almost all oxygen bleached tonnage is produced using high-consistency systems (20% to 32%). However, since the equipment to obtain this consistency is a major capital item, significant work has been done to develop systems functional at low- to mid-consistency. Work is underway with one commercial operation in Europe using an oxygen system that handles pulp at continuous digester blow consistency (mid-range). In addition, a number of proposals for low-consistency systems have been made, but to date there are no mills using these.

Various technologies using oxygen are naturally continuing to converge. Some installations have an oxygen reactor and oxidative extraction in the subsequent stages. The Norrsundet mill in Sweden is using a $(C\&D)_oD$ sequence supplied by Sunds for production of softwood kraft market pulp with a brightness of 86% to 87% ISO.

PEROXIDE SUBSTITUTION. The application of peroxide to the bleaching sequence has been reported in an estimated two dozen mills (mostly southern market pulp producers) since the beginning of last year. One reason may be its flexibility. Peroxide can be used in different stages for different reasons, with reportedly a very high return on investment.

Another justification is price. Peroxide has always been a costly chemical. However, when the energy crunch hit, the cost of ClO_2 generated onsite using sodium chlorate (another energy-intense chemical) skyrocketed at a rate higher than inflation, making ClO_2 increasingly expensive relative to other chemicals. As a result, peroxide became more attractive. Generation of peroxide has also become more efficient, which should help to further stabilize price.

The methods for H_2O_2 substitution are fairly simple and involve relatively low capital costs. Mills surveyed that use peroxide were most impressed with its application in the E_2 stage. Peroxide is added at the repulper or with a mixer to the pulp leaving the D_1 washer. The pulp is then fed to the E_2 storage, where the temperature is reduced 10° to 20° (proportional to retention time), resulting in reduced energy consumption. Mills report that chemical costs are significantly lowered. Peroxide can save ClO_2 on a 2:1 ratio and also reduces caustic use in the E_2 and buffer in other stages. Typical savings for peroxide substitution are reportedly between $3 and $4/ton pulp.

Capital investment is in the $100,000 range, which covers a storage tank for the peroxide solution, a metering device, thick-stock pump, a mixer (optional), and piping. A similar configuration is needed for peroxide application in the E_1, but reportedly is used for different reasons. Peroxide is injected with NaOH into the pulp, typically below 1% by weight of pulp. The substitution has little bleaching effect on the pulp, but can cut effluent in half since nearly 80% of all color is removed in the E_1. This small H_2O_2 addition helps oxidize this material before it is sewered. Some bleaching effect is possible since peroxide can delignify the pulp, and reducing caustic in the E_1 keeps quality consistent. Finally, peroxide can also aid in quality improvements when added in a terminal application. A 1% addition as the pulp exits the final stage enroute to the HD tower can improve brightness, brightness stability, and strength.

Peroxide is a flexible chemical and is price-stable. As with oxygen, it too has potential in short-sequence operations and other future technology.

RECENT MAJOR INSTALLATIONS. One very interesting finding of this survey is that the two newest greenfield mills in the U.S. plan to install conventional, five-stage bleach plants. Champion International Corp.'s Quinnesec, Mich., facility is reportedly installing a CEDED sequence. Great Northern Nekoosa's Leaf River Forest Products market pulp mill in New Augusta, Miss., has also ordered a CEDED bleach plant. Significantly, neither mill opted for either oxygen delignification or displacement technology. The last greenfield bleached pulp mill brought online in the U.S. was the Buckeye Cellulose mill in Oglethorpe, Ga., which installed a 1,000-tpd Kamyr oxygen system.

WASHING. The two types of bleach plant washers, vacuum drum and diffusion, have been in stiff competition in new bleach plant installations. During the past five years industry sources report that total installations are split fairly evenly between the two methods.

For mills having problems with washing efficiency and not planning any major modernization projects, one method reported by several mills to be quite successful in improving washer operation is the use of Uniflow showers, marketed since 1980 by Comarco Industrials. One Uniflow shower can replace two weir or two whistle showers at a capital cost of $8,000 to $10,000 and results in benefits in energy and chemical savings.

The showers are two-compartment units with U-shaped, perforated flow distributors located in the upper compartment, with flow rate a function of inlet pressure, hole size, and spacing. The lower section maintains an 8-in. hydraulic head over the low-velocity discharging wash solution, using two flexible seals that ride the rotating pulp mat at an adjustable contact angle. Shower flow and press roll loading are balanced for the best combination of off-washer consistency and chemical carry-over. The hot shower water applied to the mat promotes maximum heat transfer, reducing steam costs in later stages.

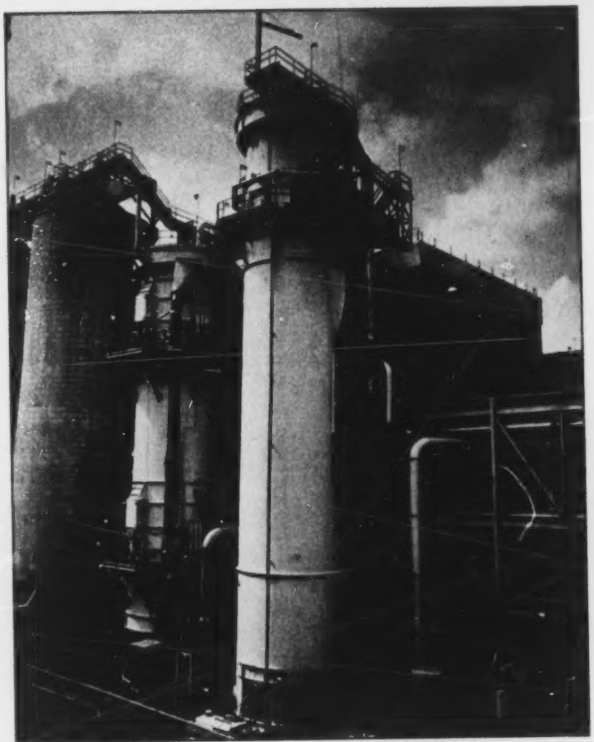
The diffusion washer has been accepted more widely with the great popularity of continuous digesters. Mills ordering new digester equipment have ordered diffusers for brownstock washing because they are reported to be simple to operate and energy efficient.

In a diffusion washer, wash liquor is injected at the center of each ring. The solid-titanium vessel extracts wash liquor from a number of concentric diffusion screens or rings. These rings move vertically, picking up plugged stock and wiping it off the screen with a rapid downstroke. A rotating scraper at the top moves the pulp to the next operation (either another diffusion stage or out-of-tower).

A number of mills reported experimenting with recycling filtrates, hot chemical additions, and other techniques to alleviate effluent problems. Design and installation are usually done in-house by mill staff, and methods vary depending on each particular case.

Filtrate recycling through washers is popular. The filtrates are collected and pumped into the suction of the previous or next washer for prebleaching the pulp and for pH stabilization. Some piping, pumps, and storage tanks are typically all that are required. Reduction in effluent, freshwater and chemicals are the chief benefits.

Problems can develop, especially when elevated temperatures are involved. Chlorine and chlorine-containing compounds are very corrosive and play havoc on unprotected equipment. Modification of equipment using FRP or similar anticorrosive material is essential. One limitation on recycling in mills using ClO_2 is the material of construction in the bleach plant, which is particularly a problem in older mills.



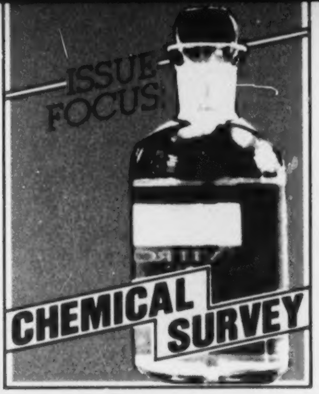
Displacement bleaching tower at Crown Zellerbach's Camas, Wash., mill.

BLEACH PLANT MODERNIZATION. The survey found that since 1980, sensors, controls, and full-control systems have been installed in many mills in the U.S. Bleach plant control gives a new look to the existing facility while paying for itself in chemical reduction, quality, consistency, and increased brightness.

To modernize the bleach plant, preliminary decisions on where and how much control is needed and capital available are necessary. Before any purchase is made, a thorough evaluation of variables associated with the proposed controls and the three principles of the bleaching process (mixing, retention, and washing) in each stage should be made.

If a full control system was installed, capital costs were reported ranging from $500,000 to $1 million including systems hardware (CPU, operator interface, color videos, printers, etc.), control software, sensors, cables, startup and training. One supplier estimated that 30% to 40% of all mill bleach plants now are fully controlled.

The major interest in process control was expressed in chlorination-stage control, particularly on a trial basis and in cases where mills had limited available capital. Equipment necessary includes sensors for brightness and chemical demand and controls for flow rates of all feed lines, pH, and consistency. Price range for these packages was reported to fall between $80,000 and $150,000, depending on the application. The sensors fit easily on a feed pipe located 15 to 60 sec after chemical injection and after the retention tower. Maintenance on the optical brighness sensors was said to be low, but higher on the residual chemical demand sensors. ■



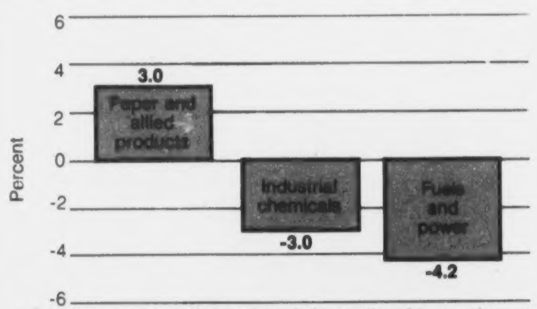
Pulp/paper chemical use, prices to strengthen slowly in 1983-84

Pulp & Paper's annual chemical survey forecasts good availability and only moderate price firming as the paper industry pulls out of recession

By BARRY SHOCKETT

■ Although most areas of the U.S. pulp and paper industry have improved somewhat from the 1982 recession, chemical demand by mills has not recovered to the same extent. Discounting has continued in some cases, although not at the same level that prevailed in 1982. The year-to-year wholesale price index for July 1983 (see Figure 1) was off again, but the decrease was less than the 5.5% reported in July 1982. On the other hand, the fuels and power index was down in the seventh month this year from 701.1 to 671.6, reflecting lower crude and natural gas prices. Nevertheless, petrochemical feedstock prices began to move up in 1983, but will probably not reach last year's list-price levels much before the second quarter in 1984. Thus, price hikes for petrochemical-based mill chemicals have not been as high as expected.

FIGURE 1: **U.S. price index changes for 1983*.**



* Only the paper and allied products index continued to experience a year-to-year increase during the first seven months of 1983.
Source: Wholesale price indexes, Bureau of Labor Statistics.

Mr. Shockett is consulting editor-chemical markets for Pulp & Paper.

An expected increase in coated paper output of between 8% and 10% in 1983 should result in greater demand for coating materials, including starch and styrene-butadiene and other latexes, as well as kaolin and titanium dioxide. By mid-September, paper and paperboard production were up 6% and 7.6%, respectively.

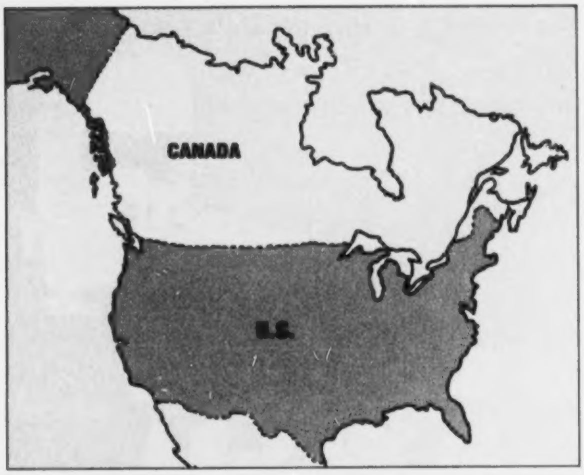
By the end of May 1983, total woodpulp production was only 2% ahead of last year. However, output of market pulp during the first five months of this year was about 6% ahead of year ago. If this rate is maintained throughout 1983, increases in the order of 5% to 7% can be expected in mill usage of larger-volume chemicals such as sodium chlorate, soda ash, chlorine and caustic.

Until early last year, caustic was in a tight situation, while chlorine demand was down. However, chlorine is usually the first of the coproducts to be affected by a recession and also the first to recover (by at least six months). Significant improvement in the construction and automotive industries this year has led to a 12% boost in polyvinyl chloride (PVC) demand, which in turn has sparked consumption of precursor chlorine. By mid-1983, chlorine output was running ahead of last year, between 8% and 9%.

The Chlorine Institute reported that operating rates in June had dropped marginally to 68.8% (from 70.7% in the previous month), although they were still higher than the 64.8% rate in the year-ago month. However, excluding the mothballed plants, actual operating levels were reportedly between 75% and 80%.

Ironically, the surge in chlorine demand has exacerbated caustic's oversupply, a situation which is not expected to improve until the worldwide economic recovery catches up to the U.S. There were signs, however, that caustic exports were beginning to turn around from last year's sharp drop to 810,000 tons (down almost 40% from 1981). At end of July, shipments out of the country were at the 1-million-ton mark on an annualized basis.

With fertilizer demand still depressed in 1983, sulfur supply remained adequate, although mill usage increased about 8%. Despite the decrease in total elemental sulfur output—by the end of July it was down 9%—recovered sulfur's share increased again to 60.5% as Frasch output dropped for the second year in a row. However, domestic shipments rose in the first seven months, resulting in an inventory reduction of almost 500,000 metric tons from that reported at end-1982.



CHEMICALS: U.S.

DEFINITIONS OF SURVEY AVAILABILITY TERMS:

Very tight—On allocation or demand significantly greater than supply.

Tight—Demand slightly greater than supply.

Market—Supply/demand in balance, or excess capacity available.

Calcium carbonate

Uses: About 85% of the calcium carbonate ($CaCO_3$) used in the paper industry is for coating, with the balance employed as filler. Precipitated grades are used in about 70% of the applications, but ground natural carbonate continues to find increased usage as finer grades are introduced.

Demand: In 1982, the paper industry consumed an estimated 145,000 tons of $CaCO_3$. With industry output up over 6% for the first seven months of 1983, carbonate consumption by the mills should rise to about 154,000 tons in 1983. Other major end-uses include plastics, coatings, and refractories.

Sources: Producers are listed in *Pulp & Paper Buyers Guide 1982*, "Register of coating and filler pigments" (p. 32).

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: Precipitated: 1983, $170-$180/ton, bulk, f.o.b. works; 1982, $160-$170/ton; 1981, $95-$160/ton; 1980, $105-$135/ton; 1979, $98-$123/ton; 1978, $95-$133/ton. Medium-ground (15-micron): 1983, $108-$116/ton, bags, truckload, f.o.b. works; 1982, $105-$108/ton; 1981, $95-$100/ton; 1980, $90-$95/ton; 1979, $82-$83/ton; 1978, $66-$76/ton.

Forecast: Precipitated carbonate prices rose about 6% in 1983 and should experience a similar boost next year. Medium-ground $CaCO_3$, on the other hand, increased about 8% in price and is expected to go up between 7% and 8% in 1984.

Caustic soda

Uses: Most of the caustic soda (sodium hydroxide) consumed by the pulp and paper industry is used by kraft and bleached sulfite mills, mainly for caustic extraction in the bleach plant. Kraft and semichemical (NSSC) mills also employ some caustic for sodium oxide makeup.

Demand: Pulp mills in 1982 consumed an estimated 1.7 million tons of sodium hydroxide, between 17% and 18% of the 9.8 million tons produced. Mill consumption in 1983 is predicted to be up about 6% to 1.8 million tons, as total caustic production this year is forecast at about 10.7 million tons. Organic and inorganic chemicals together used over 50% of the total; textiles and aluminum processing each account for about 6%.

Sources: Caustic soda is a coproduct of chlorine production. See the chlorine profile for major producers.

Availability: 1983, market; 1982, tight to market; 1981, very tight to tight; 1980, very tight; 1979, market; 1978, market.

Pricing: 1983, $265-150/ton, 50% solution, f.o.b. works, freight equalized; 1982, $315-$285/ton; 1981, $270-$320/ton; 1980, $167-$200/ton; 1979, $130-$160/ton; 1978, $160-$170/ton.

Forecast: The increased availability of caustic, because of the surge in chlorine demand (q.v.), in the face of depressed demand for the alkali has resulted in sharp drops in caustic prices (see Pricing). In fact, spot prices for export on the Gulf Coast reportedly dropped to as low as $50/metric ton. However, by the end of the third quarter, there were signs that caustic prices had bottomed out and would begin to increase slowly in 1984. The most recent export quote had risen to $75/metric ton, and some producers were offering product to domestic customers at more than $160/ton. Significant price hikes are expected in the latter part of 1984—probably around 20% to 25%—but a return to the lists prevailing in early 1982 will not take place until the second half of this decade.

Chlorine

Uses: The major end-uses for chlorine in the pulp and paper industry is as a bleaching agent in both kraft and sulfite pulp mills. Small quantities of chlorine are also employed for onsite manufacture of calcium, or sodium hypochlorite used to bleach chemical or mechanical pulps.

Demand: In 1982, chlorine demand by the pulp and paper industry was an estimated 1.2 million tons, about 13% of the total demand of 9.1 million tons. In 1983, mill consumption is expected to be about 1.3 million tons. Other major end-uses include ethylene dichloride (EDC)—the intermediate for vinyl chloride monomer (VCM) manufacture—inorganic and organic chemicals, and municipal and industrial water treatment. EDC accounts for about 22% of the total.

Sources: Approximately 25 companies in the U.S. make chlorine and caustic together by the electrolytic reduction of brine. (Relatively small quantities of chlorine are also produced by oxidation or electrolysis of hydrochloric acid). The major chloralkali producers (in decreasing order of nameplate capacity) include: Dow Chemical, PPG Industries, Diamond Shamrock, Olin, Occidental Chemicals, Vulcan Materials, Georgia-Pacific, Convent Chemical, and Pennwalt. Dow's Midland facility is still closed (since June 1982) but may be reopened next year. Other producers with several plants are also rationalizing, although one producer expects to add an additional 100,000 tpy by year-end.

Availability: 1983, market to slightly tight; 1982, market; 1981, market; 1980, market; 1979, tight to very tight; 1978, market.

Pricing: 1983, $145-$180/ton, f.o.b. works, freight equalized; 1982, $145/ton; 1981, $145/ton; 1980, $145/ton; 1979, $135-150/ton; 1978, $135-$145/ton.

Forecast: As predicted last year (see *P&P*, November 1982, p. 56), the first $20/ton boost in chlorine's off-schedule prices in September 1982 (after five previously unsuccessful attempts) has led to four consecutive quarterly increases in the selling price. Approximately $100 has been added to the depressed prices of early 1982. There may be further hikes for chlorine, but the rate of increase will slow down, particularly if caustic prices begin to move up as the improvement in world economy catches up to the U.S. recovery. Despite the increase in chlorine, however, the ECU value has actually gone down because of the sharp drop in caustic (q.v.). Currently, posted chlorine prices vary with producer and shipping point from $145-$180/ton, although one producer is listing at $150/ton at all its plants. Although over the long term chlorine usage by pulp mills will decrease gradually under pressure of continued ClO_2 substitution, demand in 1984 is expected to return to the 1981 consumption level of 1.4 million tons.

Hydrogen peroxide

Uses: Hydrogen peroxide (H_2O_2) is traditionally used in the pulp and paper industry primarily as a bleaching agent for chemical and mechanical pulps. It is also employed in the deinking of recycled newsprint.

Demand: In 1982, the pulp and paper industry used an estimated 13,500 tons, about 13% of total consumption (102,000 tons). Peroxide's major end-use is as a chemical intermediate, accounting for between 25% and 30% of total demand. Other applications include textiles, municipal water and waste treatment, industrial effluent treatment, and uranium mining.

Sources: The three remaining H_2O_2 producers, in descending order of capacity, are: FMC, E.I. DuPont, and Interox. Interox acquired PPG's Ohio plant late in 1982 and subsequently closed it early this year, while FMC shut down its small Washington unit in the second quarter of 1983.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: 1983, 43¢/lb, 70% solution, f.o.b. producing point, freight equalized; 1982, 39.5¢/lb; 1981, 35.6¢-39.5¢/lb; 1980, 35.5¢-36.5¢/lb; 1979, 32.5¢/lb; 1978, 28¢/lb.

Forecast: Despite a decrease in apparent consumption to 101,000 tons in 1983, pulp and paper industry usage is expected to increase to 15,000 tons. Increased H_2O_2 usage by kraft mills (in the E-2 stage) and continued growth in mechanical pulping should result in an annual 10% growth in industry demand over the next few years. Although some customers resisted the 43¢/lb price instituted at the beginning of 1983, the list has since firmed and is not expected to increase again until the second quarter of 1984.

Kaolin clay

Uses: Kaolin clays are employed in a wide range of paper and board grades as both filler and coating pigment. Coating applications account for about 54% of industry usage.

Demand: In 1982, an estimated 2.9 million tons of kaolin were used by the paper industry, about 74% of total kaolin consumption. In 1983, mill usage is expected to return to the 1981 level, when about 3 million tons were required. Approximate usage by grades: Nos. 1 and 2, 24%; water-washed, 22%; Nos. 3 and 4, 16%; delaminated, 13%; high-brightness and air-float, 10% each; and other, 5%. The next largest end-use is by the ceramics industry (20%), with the remaining 6% accounted for by paints, rubber, refractories, etc.

Sources: Producers are listed in *Pulp & Paper Buyers Guide 1982*, "Register of coating and filler pigments" (p. 32).

Availability: 1983, market; 1982, market; 1980, market; 1979, market to tight.

Pricing: Premium No. 1 coating: 1983, $155/ton, f.o.b. Georgia; 1982, $142/ton; 1981, $130/ton; 1980, $84/ton; 1979, $108/ton; 1978, $98/ton. Water-washed, No. 1 coating: 1983, $108.65 (same basis); 1982, $99.50/ton; 1981, $91.50/ton; 1980, $84/ton; 1979, $76/ton; 1978, $61.50/ton. Dry-ground, filler grade: 1983, $61/ton (same basis); 1982, $61/ton; 1981, $56/ton; 1980, $51/ton; 1979, $35-$44/ton; 1978, $30-$35/ton.

Forecast: Kaolin usage should recover this year as paper and paperboard output was up about 6% by the end of July (compared with the seven-month period in 1982). Continued growth of the industry in 1984 could result in another 100,000- to 200,000-ton boost in consumption next year.

Lime

Uses: The kraft mill operator requires a low-cost alkali to causticize the sodium carbonate in the green liquor. Lime is the cheapest alkali available (between 2¢ and 3¢/lb), and therefore is basic to the soda/lime route to free caustic. Kraft mills produce reburned lime onsite.

Demand: In 1982, pulp mills purchased about 930,000 tons of lime, about 6% of total consumption, which plunged to about 15 million tons (down 24% from 1981). In 1983, mill usage and total demand are both expected to increase 5% to 6%. The depressed steel industry's share dropped to 33% of the total in 1982. Other applications include sewage treatment, chemicals, and sugar refining.

Sources: The major manufacturers of merchant lime, produced mainly from calcite ($CaCO_3$) or dolomite ($CaMg[CO_3]_2$) are Genstar, Kerr-McGee, Marblehead Lime, Martin Marietta Chemicals, Mississippi Lime, Pfizer, Steetley Industries, and U.S. Gypsum. (Steetley purchased Domtar's Tacoma, Wash., plant in early 1981, while Domtar completed its withdrawal from U.S. production by closing its Bellefonte, Pa., facility in mid-1982.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight in eastern U.S.; market in West; 1978, market to tight.

Pricing: Quicklime: 1982, $57.80/ton; 1981, $51.63/ton; 1980, $46.10/ton; 1979, $41.16/ton; 1978, $36.75/ton.

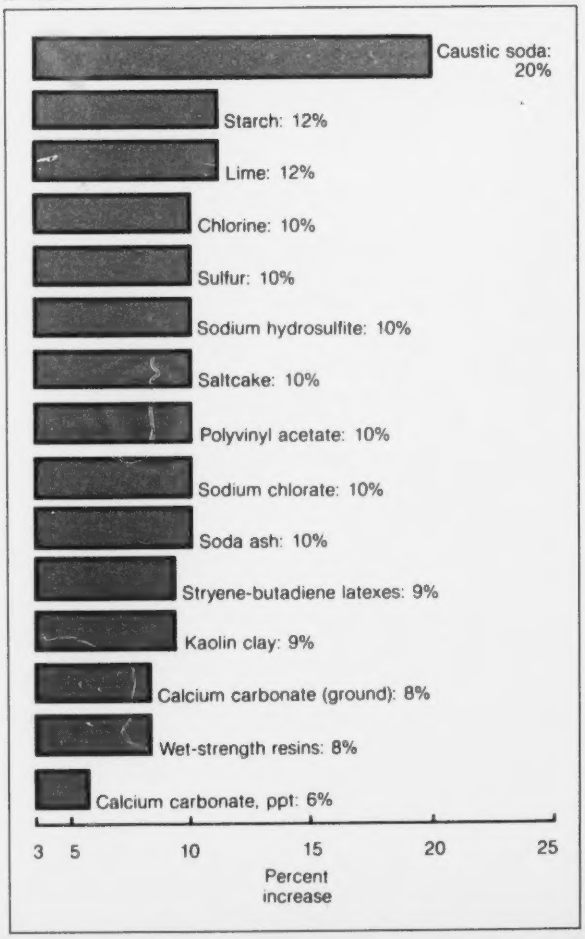
Forecast: Demand by some of the smaller end-use areas for lime should rise at least 10% this year and in 1984. However, the slow recovery by the steel industry will restrict growth in demand by that sector between 5% and 10% in 1983 and 1984, keeping overall demand growth down.

Polyvinyl alcohol

Uses: Polyvinyl alcohol (PVA) is employed by the paper industry mainly as a surface size for printing and writing papers and paperboard, and as a coating binder.

Demand: In 1982, paper industry usage of PVA was between 9

FIGURE 2: **Projected U.S. price increases for major chemicals in 1984.**



and 10 million lb, about 8% of the estimated total merchant demand of 122 million lb. In 1983, demand by paper and board mills should return to the 1981 level of almost 11 million lb, while total consumption should reach the 135-million-lb level. Imports were down to 21 million lb in 1982 (from 24 million) but at the end of July 1983 were at an annual rate of almost 35 million lb. PVA's largest end-use is for textiles (50%), followed by adhesives (25%, emulsifiers (12%), and other applications (5%).

Sources: U.S. producers of PVA, derived from the hydrolysis of polyvinyl acetate, are (in descending order of capacity): E.I. DuPont, Air Products & Chemicals, and Monsanto. Air Products & Chemicals and DuPont both make fully hydrolized (FH) PVA, while Monsanto produces only partially hydrolized (PH) material. Air Products & Chemicals also makes the PH grade and is expanding its Calvert, Ky., facility in two phases which are due onstream in early 1984 and in late 1985, respectively. DuPont's LaPorte, Texas, expansion—which will allow it to make PH product as well—has been delayed until early 1985.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1983, $1.05/lb, delivered; 1982, $1.05/lb; 1981, $1.00-$1.05/lb; 1980, 86.5¢-91.5¢/lb; 1979, 77.5¢/lb; 1978, 69.5¢/lb.

Forecast: Although paper industry usage should increase about 10% in 1983, following last year's 9% drop, annual growth over the next three or four years should average 3% to 4%. By the end of 1985, industry capacity is expected to be close to 300 million lb.

Saltcake

Uses: Saltcake (sodium sulfate) is the main source of makeup sodium and sulfur values in kraft pulp mills.

Demand: In 1982, kraft pulp mills consumed an estimated 594,000 tons of saltcake, about 48% of the total consumption of 1.24 million tons. Mill usage in 1983 is expected to increase slightly (between 2% and 3%) to approximately 608,000 tons. Other major end-uses include: detergents (39%) and glass manufacture (13%).

Sources: Sodium sulfate is produced from both natural deposits or as a byproduct in the manufacture of rayon, sodium bichromate, and hydrochloric acid. Since 1980, the share of natural sulfate has dropped to 44% from 52%. By year-end 1983, it could go down another percentage point as one of the synthetic producers brings onstream a new HCl facility in Utah. Major producers of natural saltcake include: Great Salt Lake, Kerr-McGee, and Ozark-Mahoning. (Great Salt Lake had closed its plant in April 1981 and reopened it again in 1983). Major synthetic producers are: Allied Chemical, Akzona, Avtex, Climax Chemical, Diamond Shamrock, Koppers, and Morton.

Availability: 1983, market; 1982, market; 1981, market; 1980, tight to market; 1979, market to tight; 1978, market.

Pricing: 1983, $91/ton, f.o.b. producing plant; 1982, $79-$86/ton; 1981, $68-$79/ton; 1980, $60-¢68/ton; 1979, $47-$52/ton; 1978, $35-$45/ton.

Forecast: Total sodium sulfate production is not expected to increase more than about 2%, although byproduct sulfate output should rise between 12% and 13%, as natural production drops about 10%. The long-term prospects for pulp mill saltcake consumption depends on the extent of chlorine dioxide substitution in the first bleaching stage. The effluent from ClO_2 generators contains sodium and sulfur values that can be used in place of purchased saltcake. As the economy continues to improve, mill demand in 1984 could rise another 5,000 tons or so. Imports from Canada, which reached a record level in 1982 (almost 406,000 tons) are expected to decrease this year to about 365,000 tons. However, total U.S. imports are slated to rise this year to about 435,000 tons, 11% ahead of 1982.

Sodium chlorate

Uses: The major use of sodium chlorate is for onsite generation of chlorine dioxide (ClO_2).

Demand: In 1982, pulp mills used an estimated 279,000 tons of Na_2ClO_3, 82% of total apparent consumption of about 341,000 tons. Mill demand should increase in 1983 to about 290,000 tons. Other uses are chlorates (7%), uranium processing (5%), agriculture (4%), and miscellaneous applications (2%).

Sources: The major producers of sodium chlorate—derived from electrolysis of an acidified sodium chloride solution—include Erco Industries, Georgia-Pacific, Kerr-McGee, Occidental Chemicals, Olin, and Pennwalt. Smaller facilities are operated by Brunswick Chemical, Huron Chemicals, and Pacific Engineering. Canadian imports in 1982 accounted for about 25% of total chlorate demand.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, tight.

Pricing: 1983, $420/ton, f.o.b. works, freight equalized; 1982, $420/ton; 1981, $375/ton; 1980, $345-$375/ton; 1979, $335-$345/ton.

Forecast: By next year a new producer will have come on the scene as Kema Nord Bleaching Chemicals (a division of Swedish-based Kema Nobel) acquires the Columbus, Miss., plant of Occidental Chemicals. Imports from Canada in 1983 are predicted to reach almost 95,000 tons, compared with 86,000 tons last year.

Sodium hydrosulfite

Uses: Sodium hydrosulfite is used as a bleaching agent for mechanical and deinked pulp.

Demand: In 1982, the paper industry used an estimated 16,700 tons (excluding hydrosulfite produced *in situ* from Borol). Apparent consumption is about 44,000 tons. The textile industry is the largest consumer of sodium hydrosulfite (used in vat dyeing) and accounts for about 40% of total demand. Other end-uses include clay bleaching (20%), miscellaneous (2%).

Sources: There are still only two sodium hydrosulfite producers in the U.S.: Olin and Virginia Chemicals (a Celanese subsidiary). Virginia Chemicals acquired Royce Chemical in late 1981, but subsequently closed the plant in New Jersey. Borol solution is produced solely by Morton-Thiokol's Ventron Div.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1983, 60¢-63¢/lb (proprietary blends), f.o.b. producing point; 1982, 60¢/lb; 1981, 55¢-60¢/lb; 1980, 43.5¢-55¢/lb; 1979, 41.5¢-43.5¢/lb; 1978, 39.5¢-41.5¢/lb.

Forecast: Merchant sodium hydrosulfite consumption in 1983 may reach 18,000 tons, while apparent consumption increases to about 50,000 tons. Hydrosulfite produced via Borol should also be ahead of the estimated 8,700 tons (100% basis) used by mills in 1982.

Starch

Uses: Starches are the workhorse binders for coating mills and are also used as surface sizes, internal additives, and as an adhesive for corrugated containers.

Demand: In 1982, the paper industry used an estimated 2.8 billion lb, down from the 3 billion required in the previous year, out of a total consumption of 4.3 billion lb. (In 1981, total demand was 4.4 billion lb.) In 1983, mill usage will return to the 1981 level, while total demand should rise to between 4.5 and 4.6 billion lb. Food, brewing, and textiles are other major end-uses for starch.

Sources: Producers are listed in the *P&P Buyers Guide 1981* (p. 32). About 90% of the starch used in the paper industry is cornstarch.

Availability: Unmodified: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market. Modified: 1983, market; 1982, market; 1981, tight to market; 1980, tight; 1979, tight to market.

Pricing: Unmodified: 1983, \$11.50-\$15.88/100 lb, bags, truckloads, f.o.b. plant; 1982, \$11.50-\$12.25/100 lb; 1981, \$11.25-\$14/100 lb; 1980, \$9.50-\$10.50/100 lb; 1979, \$9-\$10/100 lb; 1978, \$8/100 lb. (For bulk prices, deduct \$1.25/100 lb.) Modified starch prices vary for each grade, but generally follow price trends of unmodified starch.

Forecast: The reduced acreage, combined with adverse weather conditions this year, resulted in an almost 50% drop in the 1983 corn crop, and led to list-price hikes of about 40% by the end of the third quarter. (At the end of 1982, the list was \$11.50/100 lb.) An additional 50¢/100-lb price hike is expected by year-end, with a similar boost targeted for mid-1984. Starch demand by the mills should increase between 8% to 9% in 1984, to a predicted 3.25 billion lb, while total starch consumption ranges between 4.7 and 4.8 billion lb.

Styrene-butadiene latex

Uses: The bulk (about 90%) of the styrene-butadiene latex (SBL) employed by the paper industry is used as a coating binder, the remaining 10% accounted for by paper saturation (masking tape and wallpaper).

Demand: In 1982, an estimated 220 million lb of SBL were used by the paper industry, relatively unchanged from the previous year. On the other hand, total latex consumption fell about 3.5% to between 625 and 630 million lb, resulting in a slight increase in the industry's share of the total to 35%. In 1983, paper and board usage is expected to rise to 235 million lb, while total demand increases to 675 million lb (4% above the 1981 level). The major end-use (50%) is in carpetbacking and integral foam, followed by other textile applications and adhesives.

Sources: About 85% of the estimated 915 million lb of annual capacity in the U.S. is shared by four major suppliers (in descending order of capacity): Dow Chemical, Polysar, Reichhold Chemicals, and General Tire. Polysar achieved the second spot by its acquisition of the latex plants of Arco Chemical and GAF.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1983, 71¢-75¢/lb; 1982, 75¢/lb; 1981, 65¢-71¢/lb; 1980, 59¢/lb; 1979, 53¢/lb; 1978, 40¢-43¢/lb. (Effective May 2, 1983.)

Forecast: Feedstock costs are up in 1983, with styrene recording the largest increase, since last year it had been discounted the most. By the end of next year's first quarter, both styrene and butadiene selling prices should return to list levels. SBL prices are expected to rise another 5% to 6% next year.

Sulfur

Uses: Sulfite pulp mills consume the bulk of the sulfur used by the pulp and paper industry. Some is also used directly in kraft pulp mills.

Demand: Pulp mills used less than 1% of the total sulfur consumed in 1982, requiring about 88,000 metric tons. (Total consumption of Frasch and recovered sulfur was about 8.8 million tons.) The bulk of the sulfur purchased is for agchems, petroleum refining, rubber, plastics, inorganic chemicals, and other miscellaneous applications.

Sources: The share of elemental sulfur produced via the Frasch route dropped in 1982 to 43% (52% in 1981), while sulfur from refineries and sour natural gas production accounted for 45% of total sulfur production. Major Frasch producers include Duval, Freeport Sulphur, and Texasgulf. Major suppliers among the more than 60 firms recovering sulfur include Amoco, Atlantic Richfield, Chevron Chemical, Exxon Chemical Americas, Getty, Mobil Chemical, Pursue Gas, Standard (California and Indiana), Texaco Chemical, and Union Oil.

Availability: 1983, market; 1982, market; 1981, tight to market; 1980, tight; 1979, very tight; 1978, market to tight.

Pricing: 1983, \$131-\$124/metric ton, crude, bright, f.o.b. Gulf Coast ports; 1982, \$138.75-\$132.50/metric ton; 1981, \$131.35-\$138.75/metric ton; 1980, \$103.31-\$109/metric ton; 1979, \$70.60/metric ton; 1978, \$61.50/metric ton. Prices of both Frasch and recovered sulfur have dropped in the past year or so. In the third quarter, the f.o.b. Tampa, Fla., price for Frasch had gone down to \$130.30/metric ton, with an additional \$9.84/metric-ton discount available for large-volume customers. The heavy discounting has narrowed the Frasch/recovered differential to about 7%/metric ton from the traditional \$20/metric ton prevailing a couple of years ago.

Forecast: The economic turnaround in 1983 should result in a modest increase (between 5% and 6%) in total sulfur consumption, but selling prices will remain depressed until fertilizer markets return to normal. Usage by the pulp and paper industry is also expected to rise in 1983 to about 95,000 metric tons.

Titanium dioxide

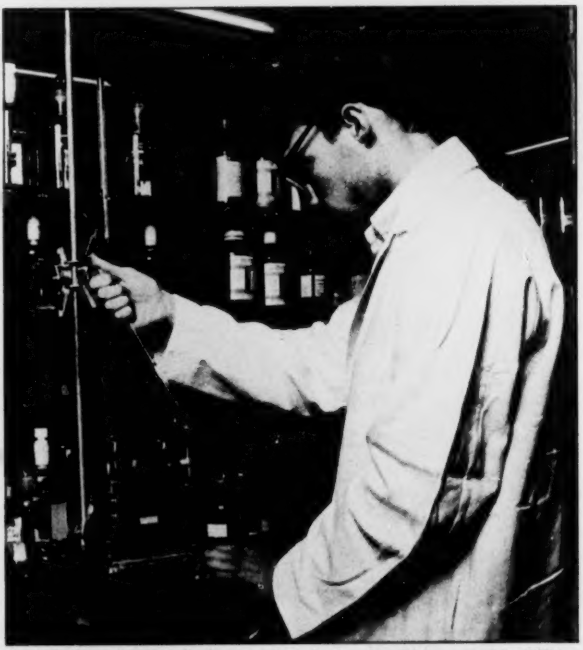
Uses: Both rutile and anatase grades of titanium dioxide (TiO_2) are used by fine paper and board mills as filler and in coating.

Demand: In 1982, mill demand for TiO_2 was down to an estimated 172,000 tons, out of a total apparent consumption of about 720,000 tons. In 1983, mill usage should exceed the 190,000-ton level as total demand also recovers. The largest end-use is by the paint industry (50%), followed by plastics (12%), rubber, and ceramics.

Sources: There are now five TiO_2 producers in the U.S. (in descending order of capacity): E.I. DuPont, SCM, American Cyanamid, Kerr-McGee, and Gulf + Western. SCM acquired G + W's Ashtabula, Ohio, plant earlier this year and plans to expand it by about 22%. Kerr-McGee's smaller expansion is due onstream in the third quarter of 1984.

Availability: Anatase: 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight. Rutile: 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight.

Pricing: Anatase: 1983, 70¢/lb, delivered; 1982, 70¢/lb; 1981, 58¢-70¢/lb; 1980, 57¢/lb; 1979, 53¢/lb; 1978, 46¢/lb. Rutile: 1983, 75¢/lb, delivered; 1982, 75¢/lb; 1981, 63¢-75¢/lb; 1980, 57¢/lb; 1979, 59¢/lb; 1978, 52¢/lb.



Availability of paper industry chemicals should be good in 1984.

Forecast: Selling prices of TiO_2 have finally stabilized, although lists are still being discounted in the range of 6¢ to 7¢/lb. No further temporary valuation allowances (TVAS) are targeted for 1983, but if the economy continues to improve, a 10% hike in the market price could bring it back to the posted level.

Other major chemicals

Alum: Demand for alum remained steady in 1983, as have prices for liquid grade, although there have been reports of dry alum lists being discounted between 17% and 18%. Liquid lists, unchanged for about two years, are still $133/ton in the North, $148.55/ton in the Northeast (New England), and $126/ton in the South. No changes are anticipated in 1983, but a possible 5% boost could occur by mid-1984.

Casein: Throughout 1983, the list price of industrial grade casein has held at the $1.365/lb mark and will probably continue to do so.

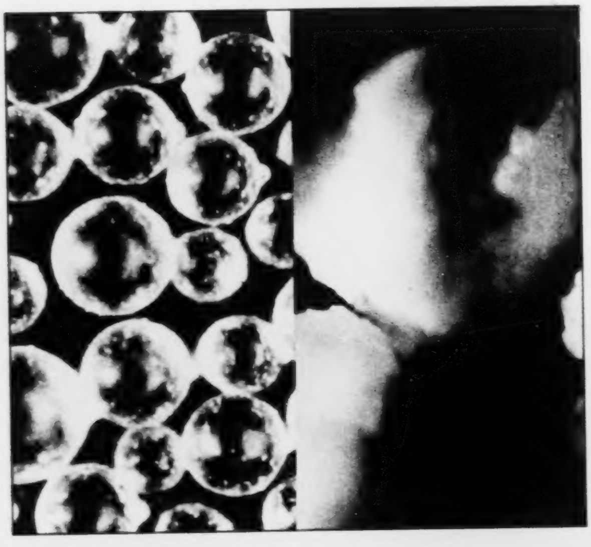
Polyethylene: Low-density, extrusion-coating grade resin had dropped to 37¢/lb at the beginning of 1983, compared with the 45¢/lb list prevailing in January 1982. However, prices have since moved up to the range of 40¢-42¢/lb, and will most likely rise between 5% and 6% in 1984.

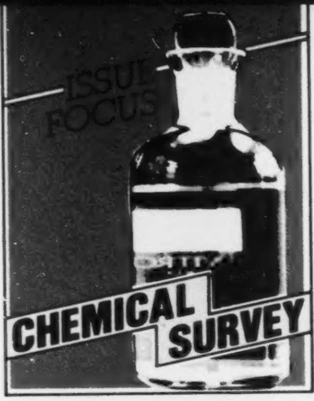
Polyvinyl acetate: List prices for copolymer coating-grade emulsions went up by 2¢/lb in May as monomer (VAM) costs rose, but large-volume buyers are still receiving discounts up to 10% off of the posted 36¢/lb price. Demand this year is up between 12% and 14%, compared with an estimated 15% drop in 1982.

Rosin sizes: A $3.30/100-lb decrease in mid-March this year has brought the price of 70% pale material to $36/100 lb. The new list will probably remain in effect for the balance of 1983 and most of 1984.

Soda ash: List prices of natural trona dropped $8/ton in 1982, the last $2/ton decrease in November 1982 bringing the new list to $84/ton. This price was unchanged during 1983. Although the posted price for synthetic ash (by Allied), f.o.b. Syracuse, N.Y., has remained at the $132/ton level, there are reports of discounting to match the $8/ton decrease for trona.

Wet-strength resins: The posted prices for wet-strength resins have not changed since July 1, 1982, and are expected to hold for the balance of this year. Polyamid-epichlorohydrin (PEC) prices (12.5% solids) are still listed at $23.45/100 lb ($1.88/lb on a dry basis), while urea-formaldehyde (UF) continues to be priced at $20/100 lb and $14.30/100 lb, respectively, for 35% and 25% solids content. (UF dry-weight price is 57¢/lb.) A 6% to 8% hike is expected sometime in 1984.





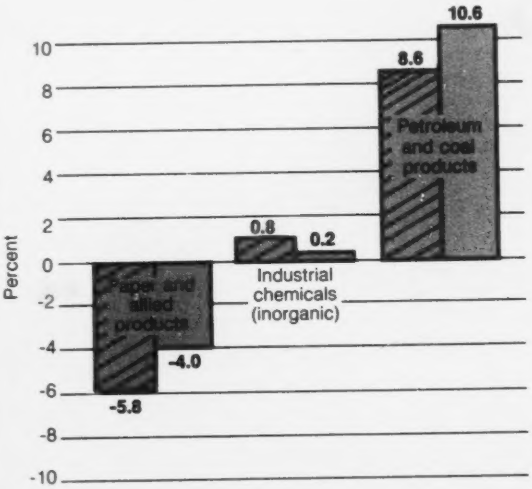
Canadian chemical second half of '83,

■ 1983 began rather inauspiciously as the Canadian pulp and paper industry struggled to climb out of last year's recession—which was reportedly deeper than that experienced in the U.S. However, total chemical demand by mills is expected to be up in 1983, as the second half of the year began to show some signs of significant improvement.

For example, at the half-year mark, production of bleached kraft pulp was down 1% from 1982 levels, but by the end of August production had moved 7% ahead of 1982. In addition, mill inventory for all chemical pulps dropped between 13% and 14% during the eight-month period, reflecting the almost 12% increase in shipments.

A similar improvement was realized by the newsprint sector, although the increase was less dramatic. By the end of August, newsprint production was still down marginally (off 0.3%), compared with the year-ago period, but it was a significant turnaround from mid-year

FIGURE 3: **Canadian price index changes for 1983.**



Shaded column shows changes for first three months of 1983; unshaded data is for first seven months of this year.
Source: Statistics Canada, Industrial Prices Div.

use to pick up in easing discounting

when output was off 4%. Newsprint shipments, on the other hand, were up almost 16.5% after eight months, while mill stocks were reduced some 13% below 1982 levels.

Recovery in mill demand should also mitigate the discounting for pulp and paper chemicals which continued into 1983. The increase in the inorganic chemicals index in July 1983 (see Figure 3) was sharply below the annual hike recorded in the year-ago month (see *P&P*, November 1982, p. 59).

Although there have been some list-price boosts in 1983, with the exception of chlorine, increases have been relatively low. Chlorine prices were boosted to balance the ECU rate and rose 9.7% at the beginning of 1983 and almost 12% on July 1.

Sodium chlorate lists were raised 6% on Jan. 1, while saltcake went up on Apr. 1. There were no price boosts for caustic, soda ash or sulfuric acid. Chlorate and caustic producers indicated earlier this year that they would dispense with discounts once the pulp and paper industry returned to profitability.

As was also the case in the U.S., total Canadian demand for chlorine in 1983 surpassed demand for its coproduct because of the recovery in polyvinyl chloride (PVC) markets both worldwide and domestically. It is expected that the production of ethylene dichloride (EDC) will require upward of 590,000 tons of chlorine this year, compared with the approximately 485,000 tons required in 1982.

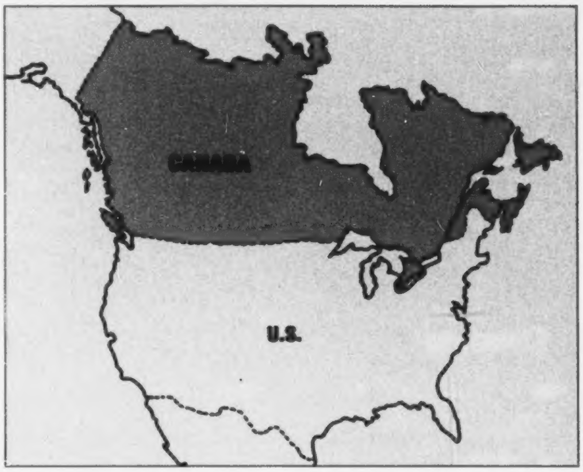
Hydrogen peroxide demand did not reach the level predicted for 1982 (in fact, it only increased about 200 tons), primarily because a couple of mills postponed their expansion plans until 1983. However, the increase in mill usage this year will more than make up for the flat year in 1982. Interox America became the third H_2O_2 supplier to operate from a Canadian base when it completed its proposed storage and distribution terminal in Toronto in mid-1983. Interox had originally intended to build the terminal in Milton, Ont. ■

DEFINITIONS OF SURVEY AVAILABILITY TERMS:

Very tight—On allocation or demand significantly greater than supply.

Tight—Demand slightly greater than supply.

Market—Supply/demand in balance, or excess capacity available.



CHEMICALS: CANADA

Aluminum sulfate

Uses: Alum usage is split about 50:50 between the precipitation of rosin size and pitch control/water treatment applications.

Demand: In 1982, paper mills consumed 98,000 tons, or 57% of total alum consumption. In 1983, total mill usage is expected to increase to 104,000 tons (56% of total demand), of which about 52,000 will be used for sizing. Total alum consumption in 1982 was 171,000 tons (off 4% from the previous year) and in 1983 should reach 185,000 tons. Municipal waste and sewage treatment applications now account for about 35% of total demand, with the balance going into pigments, cellulose insulation, and other miscellaneous end-uses.

Sources: There are two major Canadian alum producers—Alcan Smelters & Chemicals and Allied Chemicals Canada—and three smaller firms in western Canada, the largest (with two plants) being Inland Chemicals (a C-I-L subsidiary). United Chemicals, the smallest of the three, built a second plant in Calgary, Alta., last year to supply the city's sewage treatment facility.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market to tight.

Pricing: 1983, $131.54-$139.70/ton, liquid (17% Al_2O_3), bulk, f.o.b. Valleyfield, Que.; 1982, $131.54/ton; 1981, $100.70-$119.75/ton; 1980, $86-$100.70/ton; 1979, $79-$86/ton.

Forecast: The $8/ton boost in alum prices was slated for Jan. 1, 1983, but did not go into effect until the beginning of the second quarter. No further hike is expected in 1983. Mill usage should grow between 4% and 5%/year through 1987, while total demand should increase at the same rate, primarily due to the expected 9% to 10% growth in sewage treatment uses.

Caustic soda

Uses: Caustic soda (NaOH) is used in the extraction stages of kraft or sulfite bleach plants, for hypochlorite makeup and in sulfite pulping.

Demand: In 1982, pulp mills consumed about 893,000 tons of caustic (63% of total domestic demand), with 661,000 tons used in the bleach plant. An additional 282,000 tons were employed for pulping applications. In 1983, demand should rise between 5% and 6% to 943,000 tons (707,000 tons for bleaching end-uses). The next largest end-uses are in the production of propylene oxide and alumina, which last year accounted for 7% and 5.5%, respectively, of total demand.

Sources: Caustic is a coproduct of chlorine production. See the chlorine profile for major producers.

Availability: 1983, market; 1982, tight to market; 1981, very tight to market; 1980, very tight; 1979, tight; 1978, tight.

Pricing: 1983, $417/ton, 50% solution, bulk, f.o.b. works, freight equalized; 1982, $381-$417/ton; 1981, $293-$381/ton; 1980, $195-$293/ton; 1979, $183-$195/ton; 1978, $175-$183/ton.

Forecast: Unlike chlorine, caustic prices have remained steady since April 1982 and are not likely to increase before early next year. Pulp production is beginning to show signs of recovering from the 1982 recession, with industry output up almost 12% in June. If this pace is maintained, caustic demand should grow at least another 6% in 1984.

Chlorine

Uses: Chlorine's major use by the pulp and paper industry is as a bleaching agent in kraft and sulfite pulp mills. A smaller use is for onsite hypochlorite makeup.

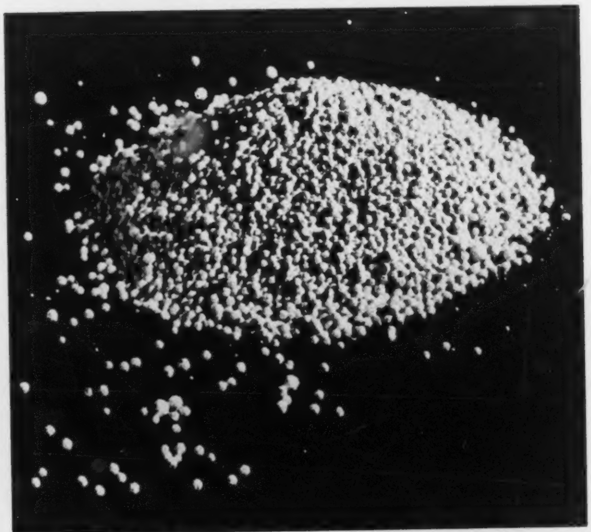
Demand: In 1982, the pulp and paper industry used about 507,000 tons of chlorine, down about 10% from the 562,000 tons consumed in 1981. In 1983, demand by mills is expected to increase between 4% and 5%—to 529,000 tons—although the industry share of total demand will drop to 37.5%. The major end-use for chlorine, ethylene dichloride (EDC) production, should account for 42% of the total in 1983.

Sources: Chlorine is produced along with caustic by the electrolytic reduction of brine. Major chloralkali producers include C-I-L, Canadian Occidental Petroleum, Dow Chemical Canada, FMC Chemicals, and PPG Industries' Stanchem Div.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight; 1978, tight.

Pricing: 1983, $308.45[1]-$344.75[2]/ton, bulk, f.o.b. works; 1982, $254-$281.25/ton; 1981, $225-$254/ton; 1980, $195-$225/ton; 1979, $163-$195/ton; 1978, $145-$163/ton. (1. Effective Jan. 1, 1983. 2. Effective July 1, 1983.)

Forecast: Although chlorine prices normally are raised once a year, the second price boost in 1983 was not unexpected, in view of the need by the chloralkali producers to restore their ECU value. A third increase could occur before year-end. Chlorine usage by the mills will decrease over the longer term as ClO_2 use grows, but not as quickly as originally projected. Only one mill has replaced the theoretical maximum of its first-stage chlorine requirements, while most mills operate in the 6% to 8% range. Four mills are replacing between 25% and 30% of their chlorine needs. In the immediate future, chlorine demand by the mills should grow about 2%/year to 1987.



Demand growth for lime should taper off in the long term.

Hydrogen peroxide

Uses: The pulp and paper industry employs hydrogen peroxide (H_2O_2) as a bleaching agent for mechanical and chemical pulps. It is also used in the bleach plant as a partial replacement for ClO_2.

Demand: In 1982, Canadian mills used an estimated 5,100 tons of H_2O_2, about 68% of total peroxide consumption. In 1983, mill usage is predicted to reach 6,800 tons, 72.5% of total demand. Other end-uses include textiles (8%), water treatment (5%), and miscellaneous applications (14%).

Sources: All of the peroxide consumed in Canada is imported. The major importers are C-I-L and DuPont Canada, which bring in H_2O_2 from FMC and E.I. DuPont, respectively. FMC and Interox America ship in some on a direct basis, while several distributors handle European H_2O_2.

Availability: 1983, market; 1982, market; 1981, market; 1980, market to tight; 1979, market; 1978, market.

Pricing: 1983, 58.7¢/lb[1], bulk, 70% solution, f.o.b. Toronto, Ont./Montreal, Que.; 1982, 52.5¢/lb; 1981, 52.5¢/lb; 1980, 44¢-47.5¢/lb; 1979, 41¢-44¢/lb; 1978, 36¢-41¢/lb. (1. Effective Jan. 1, 1983.)

Forecast: As expected, hydrogen peroxide prices rose at the beginning of 1983 but are not slated to change much before the second quarter of 1984. Consumption of H_2O_2 by mills could reach the 15,000-ton level by 1987.

Hydrosulfites, borohydride solution

Uses: Almost all newsprint mills bleach groundwood with hydrosulfite, purchased or generatedonsite via the Borol process.

Demand: In 1982, the pulp and paper industry used an estimated 9,700 tons of merchant sodium hydrosulfite and an additional 8,400 tons of Borol (12% active borohydride basis). Vat drying of cotton accounted for about 12%.

Sources: No hydrosulfite is produced in Canada. VirChem Canada imports blended hydrosulfites from its U.S. parent, Virginia Chemicals (a subsidiary of Celanese), while various distributors import product from Europe. Morton-Thiokol's Ventron Div. supplies Borol.

Availability: Hydrosulfite blends: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: Blended: 1983, 71¢/lb, delivered, eastern Canada; 1982, 69.4¢-71¢/lb; 1981, 59¢-69¢/lb; 1980, 51.4¢/lb. Nonblended: 1983, 61¢-68¢/lb; 1982, 61¢-71.5¢/lb; 1981, 66.4¢-71.5¢/lb; 1980, 56¢-71.5¢/lb; 1979, 47.5¢-56¢/lb.

Forecast: Mill usage should rise to 9,000 tons in 1982. Last year, mill downtime reduced consumption by about 500 tons. Annual demand growth for the next three to four years should average about 8%. Borol usage increased in 1982 about 9% and should grow an additional 5% in 1983 (to 8,800 tons), while the average annual increase to 1987 will be about 7%.

Kaolin

Uses: Kaolin is used by paper and paperboard mills as a coating pigment (57%) and as a filler (43%).

Demand: In 1982, coating applications consumed an estimated 115,000 tons of kaolin clay, while an additional 90,000 tons were used as a filler, representing about 87% of total kaolin demand. In 1983, usage should increase to 129,500 tons and 90,000 tons, respectively. Until this year, imports had decreased annually since 1980, however, at the half-way mark in 1983, imports from the U.S. were running at an annualized rate of about 267,000 tons, compared with the 227,000 tons imported last year.

Sources: U.S. suppliers are listed in *P&P Buyers Guide 1982* (p. 32). **Imports primarily from the U.K. have fallen off sharply, dropping to 780 tons in 1982 from 21,500 tons in 1981.**

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market to tight.

Pricing: Water-washed No. 1 coating grade: 1983, $218-$255/ton, f.o.b. Georgia; 1982, $218/ton; 1981, $215-$218/ton; 1980, $208-$218/ton; 1979, $194-$208/ton. Dry-ground, air-floated filler grade: 1983, $60/ton (same basis); 1982, $60/ton; 1981, $47-$60/ton; 1980, $43-$47/ton; 1979, $35-$43/ton.

Forecast: Mill demand should rise 5% and 7% for coating and filler pigments, respectively, on the average over the next four years. Consumption by 1987 should be 155,000 and 117,000 tons, respectively.

Lime

Uses: Kraft mills purchase lime to supplement their calcium requirements in the recovery cycle.

Demand: In 1982, pulp mills purchased an estimated 238,500 tons of lime (12.5%) out of a total consumption of slightly less than 2 million tons. In 1983, mill lime usage should increase by about 7,500 tons. The largest lime consumers are iron and steel mills, which consumed 570,000 tons in 1982, down sharply from the 711,000 tons used in 1981. Other lime end-uses, in descending order of volume, include chemicals, uranium recovery, nonferrous smelters, water and sewage treatment, and sugar refining.

Sources: There are about nine merchant lime producers in Canada. The three major firms (based on nameplate capacity) are Domtar, Steel Bros. of Canada, and BeachviLime, which has a captive steel company customer as well (Dofasco). Algoma Steel and Steel Co. of Canada also have large captive operations. Most lime plants are located within reasonable shipping distance of their customers because of high transportation costs, which continue to escalate.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight to market; 1978, market.

Pricing: Quicklime: 1983, $60/ton, bulk, f.o.b. Ont. producing plant; 1982, $55-$59/ton; 1981, $46-$55/ton; 1980, $40.98-$46/ton; 1979, $34.98/ton; 1978, $32.48-$34.98/ton.

Forecast: The percentage of total lime consumption accounted for by mill purchases will decline over the long term, particularly as more mills opt for oxygen enrichment in the lime kiln. However, over the next four years, merchant lime usage should increase between 3% and 4%/year. Last year's 20% drop in steel output resulted in total lime demand decreasing by 8.5%. Demand growth had already begun to slip in 1981 (up 1.7%), after rising an average of 5.5%/year from 1971-79. Exports were down last year as well (over 35%) since the bulk of shipments to the U.S. are to the steel industry.

Saltcake

Uses: Saltcake is used by kraft pulp mills for sodium and sulfur makeup.

Demand: In 1982, pulp mills used 237,000 tons, about 75% of total sulfate demand (318,000 tons). The slump in the market pulp area resulted in an almost 25% drop from 1981. Mill consumption should decrease about 2.5% in 1983.

Sources: Most sodium sulfate comes from the Glauber's salt deposits in Alberta and Saskatchewan. Byproduct sulfate capacity is only 11% of total. Major producers include Alberta Sulphate, Hudson's Bay Mining & Smelting's Francana Minerals Div., Midwest Chemicals, Ormiston Mining & Smelting, and Saskatchewan Minerals. The latter firm acquired the closed facility of Sybouts Sodium Sulphate in late 1981 and reopened it last May. Saskatchewan Minerals also placed its small (40,000-tpy) Bishopric unit on indefinite standby at the beginning of 1983. The two byproduct sulfate producers are Courtaulds and Ontario Paper, both in eastern Canada.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1983, $75-$81[1]/ton, bulk, saltcake, f.o.b. producing point; 1982, $70-$75/ton; 1981, $55-$70/ton; 1980, $50-$55/ton; 1979, $50/ton; 1978, $45-$50/ton. (1. Effective Apr. 1, 1983.)

Forecast: There has been no change in the price of saltcake since spring and none is expected this year. If pulp markets continue to improve, an 8% to 10% boost could occur by the second or third quarter in 1984. Over the long term, more effluent recycling from ClO_2 generators will reduce the amount of saltcake mills purchase.

Sodium chlorate

Uses: Sodium chlorate is used in chlorine dioxide generators.

Demand: In 1982, pulp mills used an estimated 183,000 tons of sodium chlorate, about 95% of total chlorate consumption (194,000 tons). The slowdown in pulp markets reduced mill demand last year by about 7%. Uranium leaching, the only other significant end-use for chlorate, required about 10,500 tons in 1982.

Sources: Canadian merchant producers of sodium chlorate are BCM Technologies, Canadian Occidental, Erco Industries, QueNord, and PPG Industries' Stanchem Div. BCM's new plant near Windsor, Que., went onstream in the third quarter. QueNord has undergone two name changes since 1979 when it began operations as QueNord Chemicals. In 1982, it took the name of its Swedish parent KemaNobel and early this year reverted to QueNord. The three remaining captive producers are B.C. Chemicals, St. Anne Chemical, and Saskatoon Chemicals.

Availability: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, tight.

Pricing: 1983, $435/ton, bulk, f.o.b. works, freight equalized; 1982, $410/ton; 1981, $365/ton; 1980, $310-$330/ton; 1979, $310-$330/ton; 1978, $250-$281/ton.

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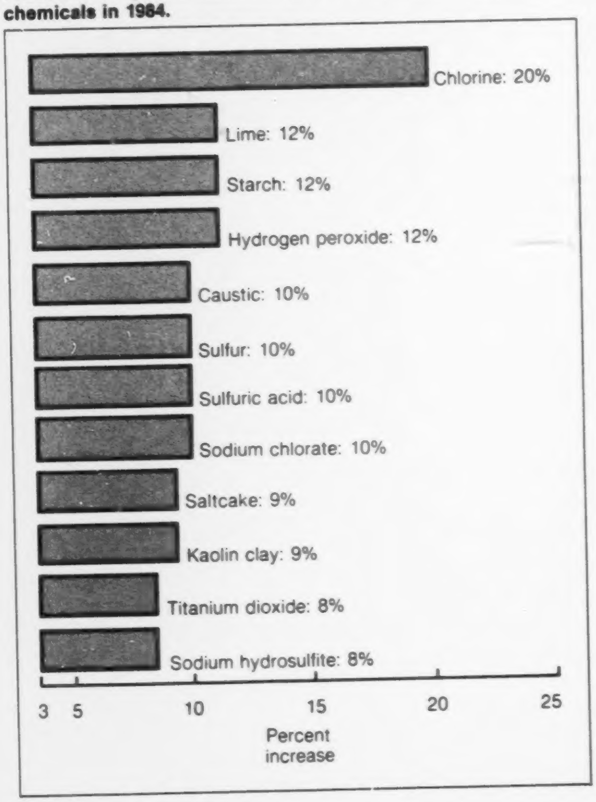

FIGURE 4: **Projected Canadian price increases for major chemicals in 1984.**

Forecast: Pulp mill demand for sodium chlorate is expected to increase by approximately 12% to 205,000 tons in 1983, and then continue to grow about 8%/year to mid-decade. No boost in the list price, effective Jan. 1, 1983, is expected before next year.

Starch

Uses: The paper industry's major use of starch (about 80%) is at the size press, with some employed in coating. Wet end applications account for a small quantity.

Demand: In 1982, the paper industry used an estimated 70,000 tons of starch, about 16% of total consumption; this should increase about 4,400 tons in 1983. The production of corn sweeteners accounted for about 64% of total demand in 1982. Other end-uses include food starches, corrugated and other adhesives, ore flotation, and other applications.

Sources: The bulk of the starch used by the paper industry is derived from corn. Major cornstarch producers include Canada Starch, Nacan Products, St. Lawrence Starch, and Zymaize. International Grain Products is a smaller producer of cornstarch and also supplies wheat starch.

Availability: Unmodified: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market. Modified: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market.

Pricing: 1983, native pearl (unmodified), $19.79-$21.77/100 lb, truckload, bags, f.o.b. Toronto, Ont./Montreal, Que.; 1982, $19.25-$20.70/100 lb; 1981, $19.25/100 lb; 1980, $14.59-$19.25/100 lb; 1979, $14.59/100 lb; 1978, $12.60-$14.59/100 lb. Modified starch prices vary according to grade and generally follow the price trend for unmodified starches.

Forecast: Reduced U.S. crop forecasts for 1983 of almost 50% from last year's record crop has firmed prices. Unmodified pearl starch prices rose to $21.77/100 lb on Aug. 8, 1983. A 10% boost is expected by year-end or early in 1984, with an additional 10% increase expected later next year. Over the longer term, annual growth in mill demand should average between 2% and 3% to 1987.

Sulfur

Uses: Sulfite pulp mills that do not purchase liquid sulfur dioxide burn sulfur to produce gaseous SO_2 for sulfite and bisulfite cooking liquor makeup. ClO_2 generation and other uses in the bleach plant consume small amounts.

Demand: In 1982, an estimated 220,000 metric tons of sulfur were purchased by the Canadian pulp and paper industry, accounting for about 32.5% of total consumption (about 680,000 metric tons). In 1983, the industry's usage is expected to increase about 8% to 238,000 tons, 31% of total demand. The largest end-use for sulfur is sulfuric acid production (60%), followed by carbon disulfide, rubber vulcanization, and other miscellaneous applications.

Sources: All sulfur produced in Canada is recovered, either from sour-gas operations or petroleum refineries. Major producers include Amoco, Canadian Occidental Petroleum, Canterra Energy, Chevron Standard, Dome Petroleum, Petrogas Processing, Shell, and Westcoast Transmission.

Availability: 1983, market; 1982, market; 1981, tight to market; 1980, tight; 1979, tight.

Pricing: 1983, crushed, slate, or molten, $78.72-$83.64/metric ton, f.o.b. producing point; 1982, $73.80-$81.18/ton; 1981, $59.98-$74.48/ton; 1980, $32.76-$59.98/ton; 1979, $24.82-$29.79/ton. (Note: prices in Canadian dollars.)

Forecast: Although sulfur list prices have increased over the past two years, the average selling prices for North American shipments have gone down since the beginning of this year. By May, the average (in Canadian dollars) had dropped to $59.74/metric ton from the $62.27/ton prevailing in January and the $64.36/ton recorded for 1982. Despite an estimated 8% increase in pulp and paper industry consumption this year, mill usage over the longer term will drop, and demand by 1987 will be down to 190,000 metric tons.

Sulfuric acid

Uses: The major use of sulfuric acid (H_2SO_4) is in the kraft pulp mill for chlorine dioxide generation.

Demand: In 1982, 242,500 tons of sulfuric acid were consumed by Canadian pulp mills out of a total of 3 million tons. Pulp mill use in 1983 is expected to increase to 262,500 tons. Phosphoric acid production, the major end-use, accounted for about 52% of the total in 1982, down from 60% in the previous year. Other end-uses include agricultural chemicals, petroleum refining, soaps and detergents, and viscose rayon.

Sources: Major merchant producers include Borden Chemical, Canadian Electrolytic Zinc (Noranda), Cominco, Inco Metals, Inland, Chemicals, and Kidd Creek Mines (formerly Texasgulf Canada). In 1981, Inco acquired C-I-L's Copper Cliff, Ont., plant, its output now marketed by C-I-L. C-I-L also sells Kidd Creek's acid, as well as the acid not required captively by Falconbridge Nickel. Allied Chemical ceased acid production in late 1983. Esso Chemicals Canada and Western Cooperative Fertilizers are the major captive acid producers.

Availability: 1983, market; 1982, market; 1981, tight to market; 1980, market to tight; 1979, tight to market; 1978, very tight.

Pricing: 1983, 66° Baume, $89.63[1]/ton, bulk, f.o.b. producing points, eastern Canada; 1982, $84.55/ton; 1981, $69.31-$84.55/ton; 1980, $60.87-$69.31/ton; 1979, $52.40-$60.87/ton. (1. Effective Jan. 1, 1983.)

Forecast: Pulp mill acid consumption rose 8% in 1983 (compared with a 13% drop last year), but mill demand is not expected to reach the 1981 level until mid-decade. Sulfuric acid list prices have remained steady throughout 1983, but an 8% to 10% boost is predicted for 1984.

Titanium dioxide

Uses: About 90% of the anatase titanium dioxide (TiO_2) used by the paper industry is employed for fine paper applications, with the balance used in paperboard.

Demand: Mill usage in 1982 increased 7% to 7,700 tons, 12% of a total demand of 62,500 tons. In 1983, mill demand should reach 67,250 tons. Last year, total consumption had dropped more than 10% as the major end-use for TiO_2—the paint industry—experienced a downturn of over 15%. Its share went down to 56% of the total (from about 59.5%), while plastics applications account for about 16%.

Sources: There are two domestic producers—NL Chem Canada and Tioxide of Canada—with a combined capacity of almost 83,000 tons.

Availability: Untreated anatase: 1983, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: 1983, $80/100 lb, untreated anatase, delivered, truckload, bags; 1982, $74.50-$80/100 lb; 1981, $69-$74.50/100 lb; 1980, $59-$69/100 lb; 1979, $48.50-$59/100 lb. (bulk slurry carries a 50¢/100 lb premium.)

Forecast: Although list prices for TiO_2 have not changed since Jan. 18, 1982, a 2¢/lb TVA was applied at the beginning of February, originally slated to remain in effect for three months. However, continuing pressure from low-priced imported product resulted in the TVA remaining in force until late in the third quarter. No increase in the list is anticipated much before early 1984. Mill usage is expected to increase about 8%/year over the next four years, while total demand grows between 7% and 8% during the same time frame.

NOTE

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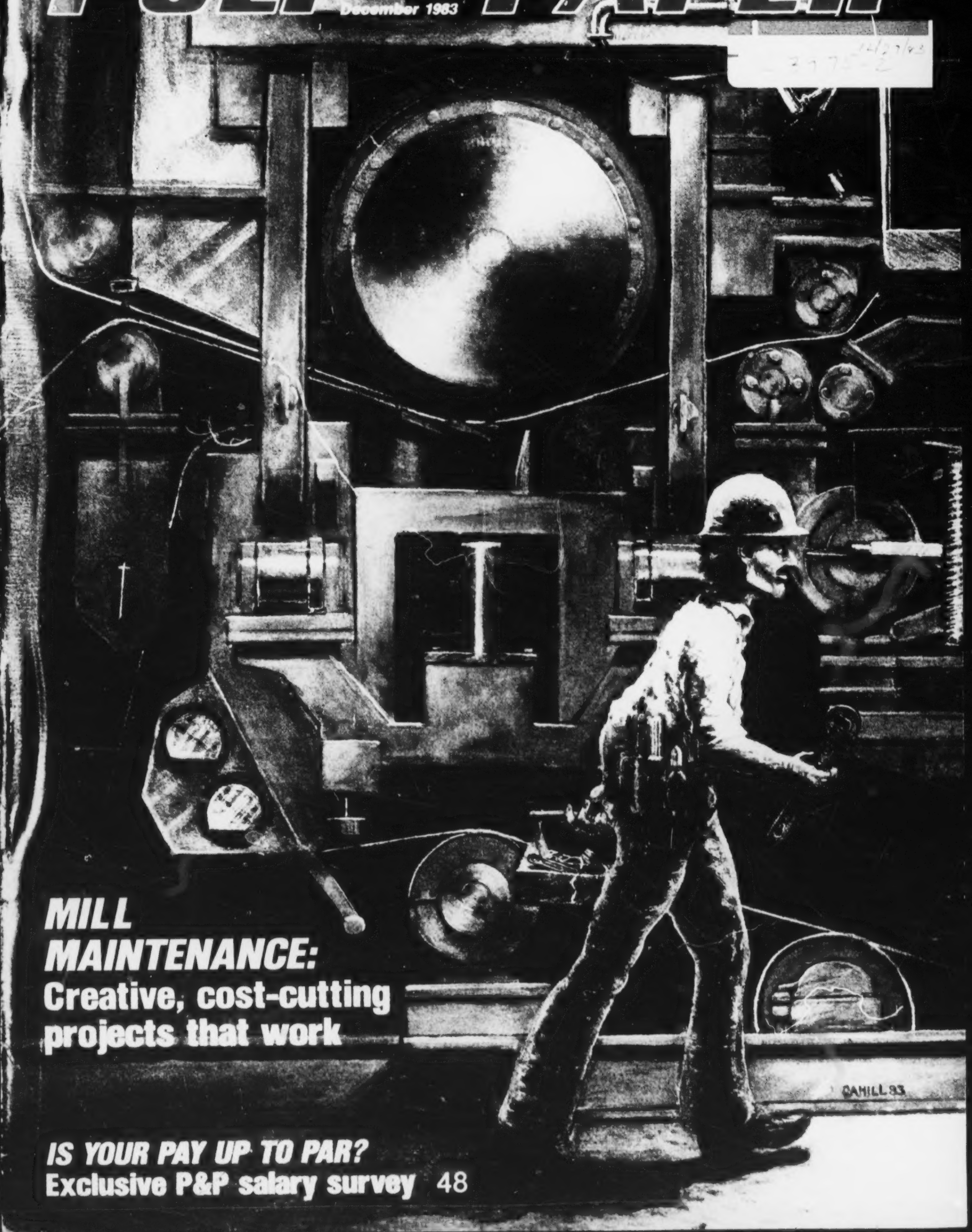


MILL MAINTENANCE:
Creative, cost-cutting projects that work

IS YOUR PAY UP TO PAR?
Exclusive P&P salary survey 48

PULP&PAPER

Volume 57 Number 13 December 1983

SALARY SURVEY **48**

P&P SURVEY: Salaries

48 **Results of exclusive *Pulp & Paper*** reader compensation/opinion survey: respondents say that morale is good in spite of the recession, salary cuts or freezes; most are happy at the job

ISSUE FOCUS: Mill Maintenance

56 **Optical alignment is becoming a necessity** for today's large, fast paper machines; extreme accuracy, simplicity, permanent monuments are major advantages over mechanical techniques

68 **Dynamic pump seals eliminate bearing failures,** cut maintenance costs on 31 process/stock pumps at Weyerhaeuser, Rothschild, Wis.

92 **Inexpensive pump repair:** special epoxy compounds allow mills to repair severely damaged pumps with minimum cost, labor; pumps can normally be back in operation within 24 hours

94 **Waste oil reclamation system at Chesapeake mill** provides 2,750 gal/month of purified oil for use as lime kiln fuel

Mill operations

62 **Great Lakes modernization of Dryden, Ont., mill** includes the replacement of 80% of major equipment in kraft pulp mill; capacity is increased by 20% to 700 tpd

86 **Decade of alkaline papermaking** at Appleton Papers' Locks mill in Wisconsin has produced many trials, tribulations—successes

Process automation

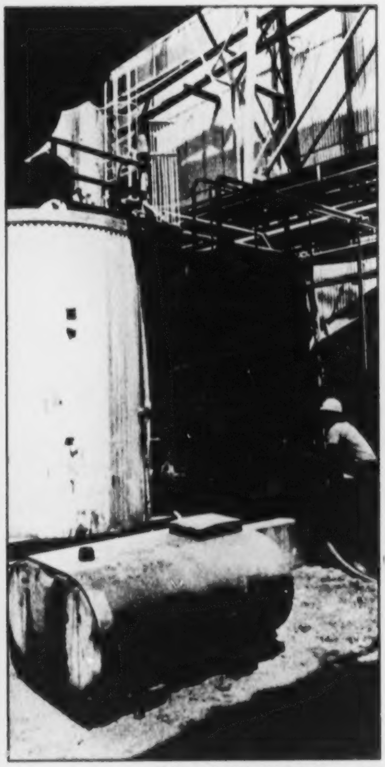
74 **Successful control projects:** avoiding pitfalls when selecting modern microprocessor-based process automation systems

78 **Process control financing options:** leasing and rental are alternatives to purchasing for control system ownership

Management

65 **Stone Container Corp. doubles capacity** in a bold, $510-million acquisition of Continental Group's brown fiber assets, including three mills and 20 converting plants; Stone's yearly sales should top $1 billion

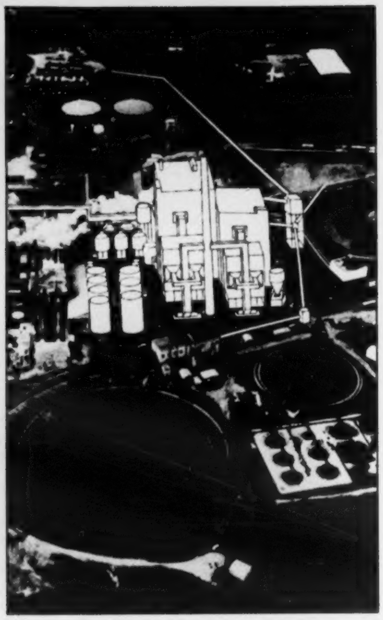
102 **Annual *P&P* editorial index** for 1983 feature articles and news items: by subject, company, news story, author, and foreign country



WASTE OIL RECLAIM **94**

COVER: *December is the busiest month for mill maintenance, our focus this issue. Illustration by Ed Cahill depicts the last-minute rush jobs before Christmas shutdown.*

Table of contents continued on page 5



SCOTT, MOBILE, POWER PROJECT 29

News

9 **Month in Statistics** —U.S. paper and paperboard production
11 **Marketing Roundup** —MB plans $500 news price in West; U.S. mills post $32 liner price hike; Canadians mull $50 hike on NBSK
21 **News Roundup** —**Sales & Earnings:** Third-quarter profits up
  23 **Expansions:** CZ unveils $300-million tissue plan; G-P to expand bleached capacity; Weyco moving ahead at Longview
  27 **Technology Roundup:** R & D cutbacks hurt synthetic pulp; nonsulfur pulping process studied; plastics made from hardwood pulp
  29 **Acquisitions:** Cascade set to buy Jonquière mill; Whippany negotiating Clifton mill sale; Rolland in the market for a pulp mill
  31 **Labor:** West Coast implements 21-day truce; UPIU goes back to work at De Ridder
  33 **News Briefs:** Stone completes CFI acquisition
  35 **International News:** Billerud considers new board machine; new liner machine for Austrian mill; Haindl looking to acquire Parenco stake
  37 **Regulatory Roundup:** Stiff gas bill may hurt B.C. mills; Nova Scotia judge okays spraying; Dow quits 2,4,5-T—and EPA hearings

GARRIGAN COMMENTS 174

Columns

7 **Editors' Notebook** —Season's greetings from the editorial staff
39 **Washington Viewpoint** —Clark—no straight man for environmentalists
41 **Labor/Management** —1984: more turnarounds for labor?
119 **Career Development** —Doing more with less
127 **Maintenance Tips** —Safety valve maintenance
161 **Chemical Markets** —Titanium dioxide
174 **Industry Comment** —Bleached paperboard prospects bright

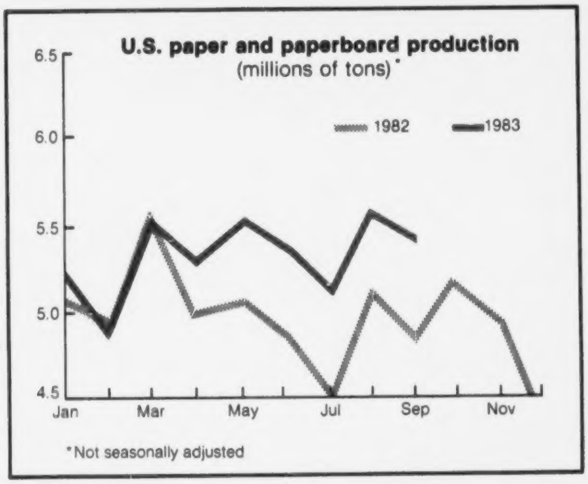
Departments

43 **Conference Calendar**
121 **News of People**
131 **Product Showcase**
133 **New Products**
151 **Product Review**
153 **Current Literature**
160 **Book Shelf**
162 **Supplier News**

Services

129 **Readers Service Index**
135 **Readers Service Card**
165 **Jobs Wanted**
166 **Professional Service Directory**
168 **Classified Advertising**
172 **Advertisers Index**

MONTH IN STATISTICS



U.S. paper and paperboard production in September totaled 5.434 million tons, up 12.1% from September 1982, according to the American Paper Institute. The August-September two-month moving average of seasonally adjusted data jumped to a record 66.8 million tpy—and preliminary data for October show production increasing to a rate above 67 million tpy. Total paper and board production for the first nine months averaged 63.8 million tpy, up 7.5% from 1982.

Among major grades, printing/writing papers continued to lead the way, with coated and uncoated free-sheet papers both posting gains above 11% over 1982. Tissue, up 11.6%, and kraft packaging and industrial papers, up 9.1%, also showed strong gains over last year. Paperboard production through September increased 13.5% over a year earlier, with linerboard up a sharp 16.7%. Corrugated box shipments through September rose 8.1% compared to 1982, according to the Fibre Box Assn.

Canadian newsprint shipments totaled 737,000 metric tons in September, up 22.7% from September 1982, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates were 86%, up from 69% last September.

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	September	415	7.5	5,132	0.8
Uncoated groundwood (s)	September	126	4.1	1,471	2.3
Coated paper (s)	September	469	11.1	5,578	11.4
Uncoated free sheet (s)	September	698	11.3	8,580	9.6
Unbleached kraft packaging and industrial (s)	September	335	9.1	3,775	2.9
Tissue	September	385	11.6	4,735	7.8
Total paper	**September**	**2,708**	**10.8**	**32,468**	**6.9**
Kraft linerboard, unbleached	September	1,320	16.7	14,950	10.1
Semichemical medium	September	395	8.2	4,673	6.0
Bleached paperboard	September	306	7.0	3,869	3.6
Recycled paperboard	September	609	13.4	7,124	8.6
Total paperboard	**September**	**2,726**	**13.5**	**31,712**	**8.0**
Total paper and paperboard*	**September**	**5,434**	**12.1**	**64,180**	**7.4**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	August	4,460	5.5	51,972	3.8
Market pulp production	August	566	7.8	6,418	8.7
Wastepaper consumption at paper/board mills	August	1,205	1.4	14,186	5.2
Pulpwood consumption (cords)	August	7,395	9.4	85,046	7.4
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	September	22.317	8.1	188.421†	6.2
Containerboard inventories at box plants	Sept. 1	2,421	−5.2		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	August	767	15.5	8,670	9.1
Imports of Canadian newsprint	August	578	13.8	6,708†	2.7
U.S. paper exports (including products)	August	380	13.4	4,605	8.0
Exports of unbleached kraft linerboard	September	200	29.9	2,244	13.3
Exports of woodpulp	August	289	3.6	3,548	1.6
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	September	737	22.7	6,188†	3.9
Operating rates	September	86%	69%	83%	83%
Inventories held by U.S. consumers	Sept. 30	1,303	−9.0		
Woodpulp shipments (export only)	September	594	21.7	4,977†	12.8
Operating rates	September	82%	61%	83%	79%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Newsprint: Economic recovery begins to bolster demand, prices

Statistics:	**1982**	**1983**	**1984e**
United States			
Production, 000 tons	5,041	5,000	5,419
Capacity, 000 tons	5,654	5,752	5,955
Utilization rate, %	89	87	91
Apparent U.S. consumption			
000 tons	11,150	11,300	11,920
lb/capita	95.6	96.4	101.0
000 tons/$billion real GNP	7.51	7.36	7.40
Canada			
Production, 000 tons	8,947	9,240	9,571
Capacity, 000 tons	10,951	11,133	11,260
Utilization rate, %	82	83	85

e=estimate

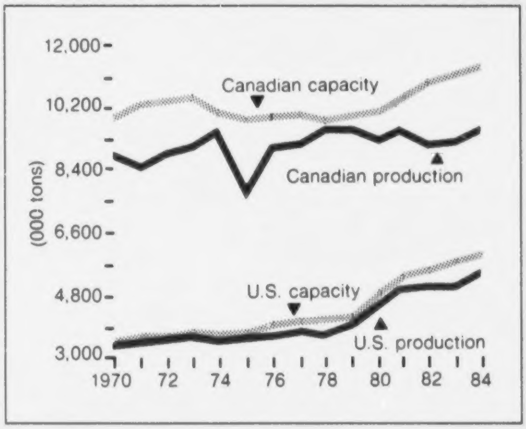
GRADE STRUCTURE. The newspaper industry is the primary consumer of newsprint. Considerably less tonnage is directed to other end uses, which include advertising supplements, government publications, comic books, and commercial printing. About one-quarter of all newsprint is used in offset printing, but most is printed on letterpress machines. Although some newsprint with basis weights of 28.5 lb/3,000 ft² and lower is made, the standard remains 30 lb.

PRODUCTION/CAPACITY. Newsprint demand began to improve during the last half of 1983, spurred on by the economic recovery in the U.S. and some signs overseas markets were starting to pick up. The two-year recession brought about some changes in the industry—the shutdown of some inefficient paper machines and conversion of others to groundwood papers resulted in a net loss of 451,000 short tpy in Canada in 1983.

At the same time, capacity in the U.S. and Canada increased. This trend is expected to continue. As U.S. producers expand domestically, Canadian market share will diminish. Canadian newsprint capacity is expected to grow at an average annual rate of 155,000 short tpy during 1983-86, to 11.57 million tons. U.S. capacity will increase to 5.99 million tons by 1985, compared to 5.75 million tons this year.

Publisher inventories were somewhat high at the end of August compared to two years ago, but down from a year earlier. Some attributed high stock levels to the threat of a strike in British Columbia, but others felt the glut would prevent any shortages even if a province-wide work stoppage lasted for a month. Some buyers began stocking up during the latter part of the summer in anticipation of price increases scheduled for July 1, some observers said.

OUTLOOK. Newsprint markets are expected to pick up through 1984 as the economic recovery accelerates. With no new newsprint capacity scheduled to come online for at least two years, operating rates should begin to pick up with supply and demand coming into balance in 1985-86. By 1985 Canadian industry operating rates should surpass 90% and may peak around 91% in 1986, according to one forecast. Prices are expected to stabilize early in 1984 and may rise in the second half of the year as producers try to restore depressed profit margins. Nevertheless, profitability in 1985-86 is not expected to achieve past cyclical peaks.



Estimated annual capacities of top companies are:

	Annual capacity (000 short tons) **Canada**	**U.S.**	**Total**	**Capacity share** (%)
1. Abitibi-Price	1,904	250	2,154	12.8
2. CIP	1,320	—	1,320	7.8
3. Bowater[1]	350	920	1,270	7.5
4. MacMillan Bloedel	1,163	—	1,163	6.9
5. Consolidated-Bathurst	1,010	—	1,010	6.0
6. St. Regis	—	811	811	4.8
7. Kimberly-Clark[2]	388	421	809	4.8
8. Boise Cascade[3]	249	461	710	4.2
9. Ontario Paper	710	—	710	4.2
10. Publishers Paper	—	585	585	3.5
11. Kruger	517	—	517	3.0
12. B.C. Forest Products	480	—	480	2.8
13. Crown Forest[4]	467	—	467	2.8

1. Includes Catawba Newsprint (51% owned) and Calhoun, Tenn. mill.
2. Includes Spruce Falls Power & Paper (50.5% owned).
3. Includes Boise Southern, DeRidder, La.
4. Former Crown Zellerbach mill, sold to Fletcher Challenge of New Zealand in 1983.

North American capacity (1983): 16.885 million tons
Capacity share of top five companies: 41.0%
Capacity share of top ten companies: 62.4%

PRICING. Prices fell $28/short ton to $425 on Nov. 1, 1982, effectively rolling back the mid-1981 price increase. In July 1983, West Coast producers rolled back prices to $404/ton, while eastern producers tried to raise prices to $454/ton by Oct. 1. Price history is as follows: (U.S. East contract): 1970, $152; 1971, $158; 1972, $165; 1973, $170; 1974, $235 (30-lb); 1975, $260; 1976, $285; 1977, $305; 1978, $345; 1979, $375; 1980, $426; 1981, $453; 1982, $425; 1983, $425/$454.

MARKETS. U.S. newspapers bought 55.9% of their newsprint from Canada in 1983, down from 56% in 1982, 59.6% in 1981 and 70% in the early 1960s. Canadian newsprint producers are expected to supply only 55% of U.S. newsprint in 1984.

(News section continues on page 21)

SALES & EARNINGS

Recovery boosts third-quarter profits

U.S. pulp and paper companies climbed further out of the recession during the third quarter, with profits up a sharp 33.7% from depressed year-earlier levels and 12.7% from the 1983 second quarter, according to a *P&P* survey of 21 companies. Sales improved 11.7% over last year and were up 3.0% from the second quarter. Forest products companies reported third-quarter profits up 138.0% over 1982, according to reports from six companies, but earnings were down a disappointing 36.6% from the second quarter.

Strong volume gains continued for most paper grades, although pulp markets remained weak, and several price increases took effect late in the quarter, most notably for linerboard. We're "basically bullish about the future," said Champion International Corp. chairman and CEO Andrew C. Sigler. "Prices are moving up in all our businesses, costs have leveled off, and we're running full."

International Paper Co. reported net income of $66.9 million for the third quarter, up 106.5% from a year earlier. Crown Zellerbach Corp. posted third-quarter earnings of $22.3 million, up a healthy 201.4% from the 1982 quarter. St. Regis Corp. reported profits of $18.7 million for the quarter, down 62.5% from 1982.

Mead Corp. reported third-quarter income of $16.0 million, compared to a loss of $17.9 million in 1982. Union Camp Corp.'s $34.5-million net for the quarter was up 20.2% from last year.

Among tissue producers, Scott Paper Co.'s third-quarter net was $36.1 million, up 60.7% from 1982. Kimberly-Clark Corp.'s third-quarter profits of $43.5 million were down 19.4% from 1982, while Fort Howard Paper Co.'s quarterly earnings of $29.4 million were up 18.0% from 1982.

Price slump hurts wood products. While earnings improved greatly compared with the 1982 third quarter, most of the forest products companies surveyed reported earnings off from the 1983 second quarter. Georgia-Pacific Corp.'s net income of $3 million for the quarter compared to a loss of $1 million a year ago. Weyerhaeuser Co.'s third-quarter profits of $53.2 million were up 110.3% from last year. Champion International Corp. announced net profits of $24.5 million for the quarter, up 47.3% from last year. Boise Cascade Corp. posted earnings of $18.1 million for the third quarter, a whopping 624.9% increase over 1982. Louisiana-Pacific Corp.'s earnings of $4.4 million were up 578.5%.

Canadian mills post gains. Canadian pulp and paper companies in the third quarter continued to regain ground lost during the recent recession. The 10 companies surveyed by *P&P* reported an aggregate profit of C$31.3 million for the quarter, a substantial improvement compared to the loss of $38.6 million posted last year. Third-quarter sales of $2.37 billion were up 12.3% from a year earlier.

Price increases were pushed through for lightweight coated paper and uncoated free sheet during the quarter, and longer backlogs for uncoated groundwood papers were reported. But falling lumber prices cut into profits, while the strong U.S. dollar combined with Scandinavian competition slowed improvement in pulp markets.

U.S. PAPER/FOREST PRODUCTS RESULTS

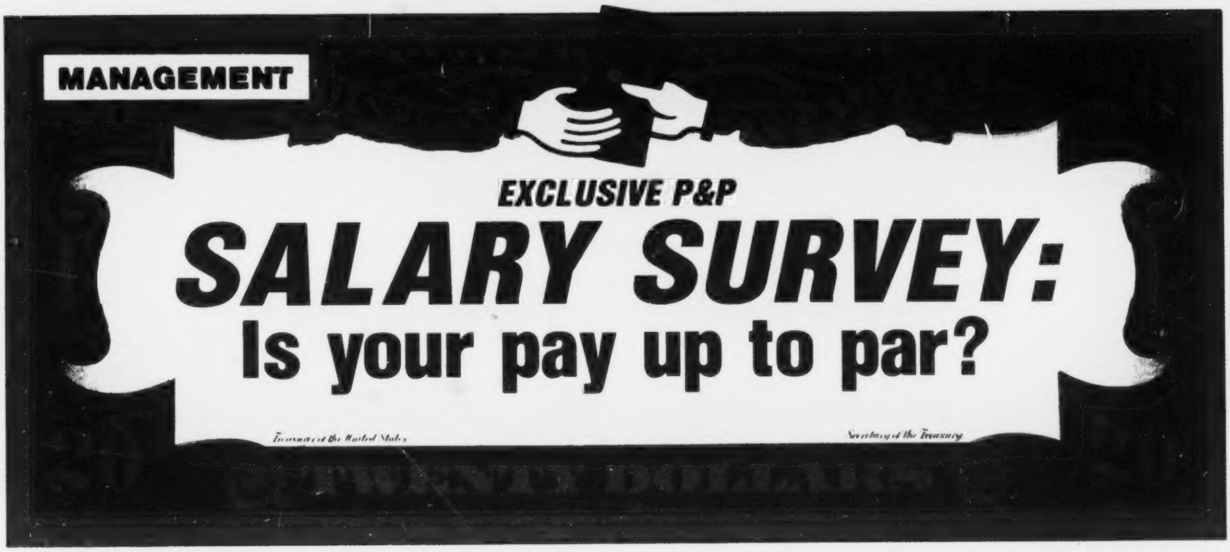
	Third quarter (000 dollars)			
Paper companies	**Sales**	**Change 1983/82**	**Earnings[1]**	**Change 1983/82**
Consolidated	$139,157	4.2%	$10,778	−0.5%
Crown Zellerbach	711,800	−5.0	22,300	201.4[2]
Federal Paper	131,932	15.0	2,252	−17.8
Fort Howard	224,490	48.7	29,410	18.0
Glatfelter	61,554	7.5	4,568	6.4
GN Nekoosa	385,500	8.0	16,600	−4.6
Hammermill	368,039	17.7	4,791	−19.7
Int'l. Paper	1,085,400	10.1	66,900[3]	106.5
James River (7/24)[4]	503,000	92.0	17,866	176.3
Kimberly-Clark	801,800	8.1	43,500	−19.4[5]
Longview (7/31)[4]	91,912	3.8	8,243	n.m.[6]
Mead	634,600	14.6	16,000	n.m.[6]
Pentair	73,078	11.1	2,860	9.5
St. Regis	737,717	7.1[7]	18,764	−62.5[8]
Scott	610,435	6.3	36,124	60.7
Sonoco	171,681	30.6	9,952	46.6
SW Forest	192,475	18.7	(2,350)	n.m.[6]
Stone Container	138,226	31.8	1,725	−14.7
Union Camp	469,076	25.2	34,541	20.2
Wausau (8/31)	50,462	13.9	1,369	1491.9
Westvaco	369,336	4.9	14,918	−9.2
Willamette	261,232	5.8	10,673	32.4
Total	**8,212,902**	**11.7**	**371,784**	**33.7**
Forest products				
Boise Cascade	909,480	23.5	18,050	624.9
Champion Int'l.	1,122,738	18.1	24,457	47.3[9]
Georgia-Pacific	1,709,000	20.2	3,000[10]	n.m.[6]
Louis.-Pacific	273,660	19.9	4,410	578.5
Potlatch	231,025	8.6	10,778	183.3
Weyerhaeuser	1,251,860	22.2	53,198	110.3
Total	**5,497,763**	**20.2**	**113,893**	**138.0**
U.S. total	**13,710,665**	**15.0**	**485,677**	**49.0**

CANADIAN PAPER INDUSTRY RESULTS

Abitibi	C$398,659	2.8%	C$7,055	0.7%[7]
B.C. Forest	226,600	22.3	(6,900)	n.m.
Con-Bathurst	335,900	−1.2	7,500	−20.2
Domtar	480,700	16.9	13,900	n.m.[6]
Donohue	89,400	22.6	2,300	35.3[7]
Fraser	111,521	10.1	2,323	n.m.[6]
Great Lakes	127,188	26.7	(352)	n.m.
Mac. Bloedel	497,000	16.4	600	n.m.[6]
Rolland	58,200	48.5	2,160	n.m.[6]
Scott	49,137	2.0	2,680	19.8
Total	**2,374,305**	**12.3**	**31,286**	**n.m.[6]**

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.
2. 1982 quarter includes CZ Canada interest sold effective Dec. 31, 1982.
3. Includes a pretax gain of $44.5 million from a land sale in Georgia.
4. Period ended. James River figures are first quarter; Wausau fourth.
5. 1982 quarter includes $8.3-million gain from woodlands sale.
6. Not meaningful due to loss in 1982 third quarter.
7. 1982 figures restated by company.
8. 1982 quarter includes about $38 million in pretax proceeds from sale of tax benefits and negative tax provision.
9. 1982 quarter includes approximately $7.2-million (13¢/share) gain from sale of land.
10. Includes pretax write-down of certain assets of $68 million and pretax gain of $10 million from the settlement of a energy contract dispute.

n.m. = not meaningful. ( ) = loss.



MANAGEMENT

EXCLUSIVE P&P

SALARY SURVEY:

Is your pay up to par?

A questionnaire in the September 1983 *P&P* asked readers for information on salaries, benefits, job satisfaction; tabulation is now complete

By KENNETH E. SMITH, Executive Editor

■ The September 1983 issue of *Pulp & Paper* contained a two-page, postage-paid reader survey form. Readers were asked for information on their salaries and benefits as well as opinions on their jobs, companies, the pulp and paper industry, and morale. The deadline for return of the forms was October 10, and the survey is now complete. Information contained on the survey forms was tabulated by an independent data processing service and is reported in this article and the accompanying tables.

Based on the survey responses, it seems that working conditions for professionals in the industry are still not too bad. In spite of the recession, the average respondent is reasonably well paid, stable, and happy at the job. He (96.3% of all respondents were males) probably works for a large wood products/pulp and paper company in mill operations, engineering, or technical service, located in either the Southeast or Midwest, and has a bachelor's degree in either mechanical or chemical engineering, chemistry, or paper science and technology.

Other interesting statistics from the survey are as follows:

Compensation—

- Median income of all respondents is $42,000
- Additional benefits received average $5,000 to $10,000
- Ten paid holidays and three weeks paid vacation are taken yearly on average
- Salary of respondents has been increased an average of twice in the last three years
- The last pay increase received by respondents averaged 8%
- 92.9% of respondents normally receive annual salary increases based on merit/performance (54.2%), cost-of-living index (3.5%), or both (31.5)
- 88% of all respondents are not paid overtime.

Personal—

- 99% of all respondents work full time; only 1.5% of these are self-employed
- 79.4% work for a wood products/pulp and paper manufacturer; only 12.7% are suppliers or consultants to the industry

TABLE 1: **Income distribution of respondents.**

	Income ($1,000) 1983
Lower decile	28
Lower quartile	34
Median	41
Upper quartile	52
Upper decile	65

TABLE 2: **Employee benefits.**

Benefits value ($1,000)	Respondents (%) 1983
0 to 1	0.5
1 to 2	4.2
2 to 3	6.7
3 to 4	7.7
4 to 5	6.8
5 to 10	32.4
10 to 15	21.8
15 to 20	10.0
20 to 50	9.0
Over 50	0.8

TABLE 3: **Benefits of respondents.**

Benefit	Respondents receiving benefits (%) 1983
Medical insurance	95.9
Life insurance	92.8
Profit sharing	26.6
Retirement pension plan	88.1
Company car	11.1
Bonus plan	23.9
Stock option plan	48.7
Dental insurance	80.8
Travel budget	24.6
Education allowance	49.6

- 44 hours is the average work week
- 64.7% have at least team or unit management responsibility
- Average work experience since leaving school is between 10 and 14 years
- 54.8% live in either the Southeast (29.6%) or the Midwest (25.2%)
- 33.7% are between 31 and 40 years old; 59.8% are between 31 and 50
- 88.9% have at least a bachelor's degree
- 28.1% have additional advanced degrees
- Top bachelor's degrees are in mechanical engineering (18.6%), chemical engineering (17.3%), chemistry (14.5%), and paper science and technology (13.5%)
- 48.7% work for companies with sales of more than $1 billion
- 61.6% belong to a technical or professional society
- Only 17.3% changed employers within the last three years, and then only an average of once
- Average time with present employer is 11 years
- 59.8% have been in the pulp and paper industry their entire careers.

Morale—

- On a scale of 1 (bad) to 5 (good), the average respondent ranks his job morale a 4 (above average)
- 88.1% say they like their jobs
- 83.2% say they would stay in the pulp and paper industry if they changed jobs
- 86.7% feel their companies listen to their input and value their experience.

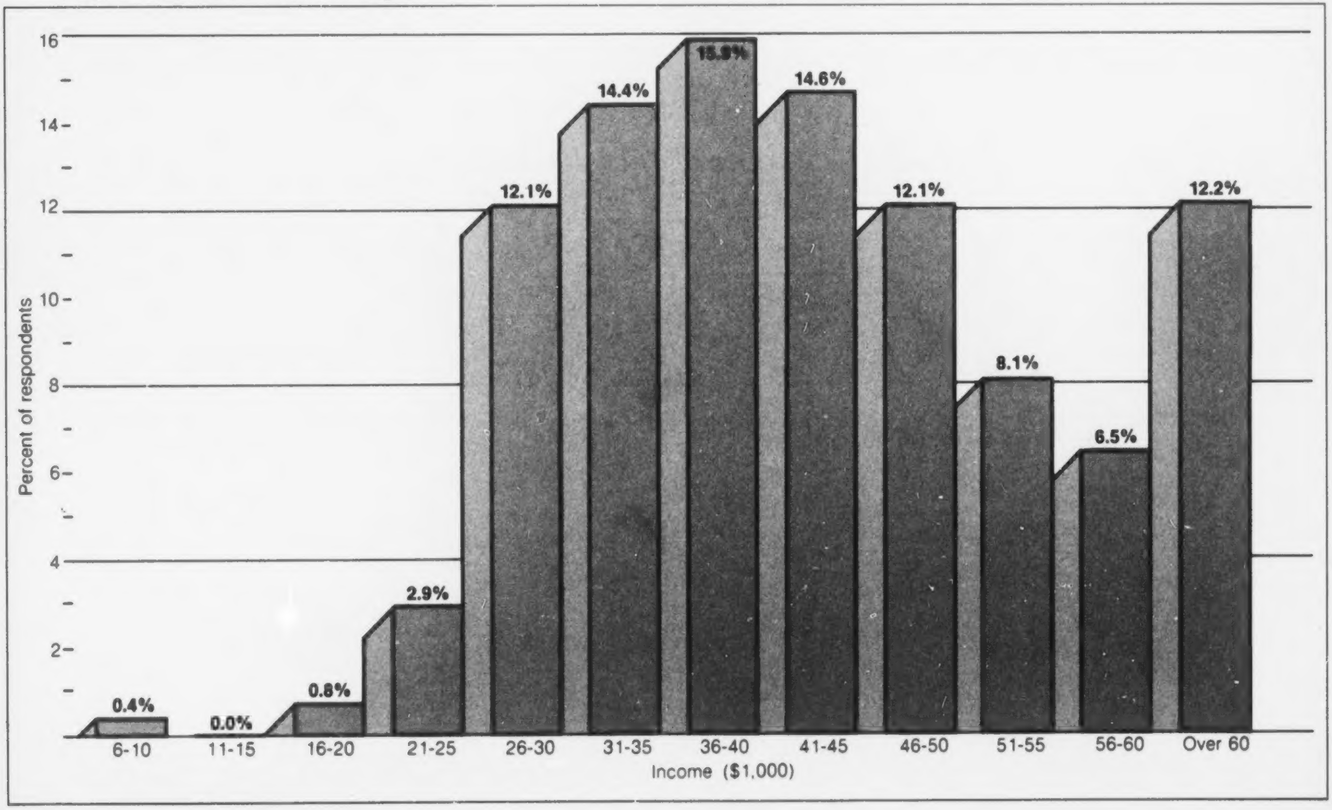
MEDIAN INCOME *of all respondents is $42,000. Benefits average between $5,000 and $10,000.*

SURVEY FOR ALL PROFESSIONALS. *P&P* has previously published articles on salaries of engineers within the industry—the most recent of which was the 1982 survey conducted by the Engineering Manpower Commission (EMC) of American Assn. of Engineering Societies and published in our May 1983 issue. However, this is the first exclusive compensation/opinion survey conducted by *P&P*.

The editors of *P&P* recognize that all professionals within the industry are not engineers. Therefore, this survey was designed to meet the needs and interests of all industry professionals. In fact, we found that more than 25% of all survey respondents have bachelor's degrees in disciplines other than engineering: 14.5% in chemistry; 7.1% in business; 3.6% in forestry/agriculture; 3.3% in liberal arts. Also, high school is the highest level of education for 7.3% of the respondents, and an associates degree is the highest level for 3.8%.

Tables 1 to 16 present survey data on compensation as compared with a number of variables such as degree, discipline, work type and experience, management level and experience, size and type of employing organization, etc. Although a few readers may not be able to find

FIGURE 1: **Income distribution of respondents.**



themselves represented by the data, we feel confident that the large majority of our readers will find useful data in this report. Income figures were obtained by adding any bonuses or additional income reported by respondents to their reported gross salary.

A word about benefits: survey respondents were asked to estimate the value of all benefits received by them as part of their compensation packages. Median values of these estimates as compared with certain variables are reported in Tables 4 to 7. Table 2 shows a breakdown of benefit values reported by respondents over certain ranges. However, the value of certain benefits such as company cars, life and medical insurance, and retirement plans is often hard to estimate, and this data may not be totally reliable. Therefore, Table 3, which lists tangible benefits usually received as part of compensation packages compared to percentage of repondents who receive each benefit, is probably a more valuable tool for comparison purposes.

88.1% OF ALL RESPONDENTS *like their jobs.*
83.2% would stay in the pulp and paper industry if they changed jobs.

ANALYZING THE DATA. Although each reader is capable of interpreting the tabulated data in this report to suit his or her individual interests, some observations are noteworthy. As previously mentioned, respondents reported an average of only two salary increases over the past three years while also noting that normally they receive annual salary reviews. This data obviously indicates salary freezes were widespread during the recession. Many respondent comments confirm this fact, and many people noted that benefits such as profit sharing and bonuses have also recently been reduced. Salary freezes will be discussed in further detail below.

The $42,000 median income of this survey's respondents compares very favorably with the $36,100 median income from the 1982 EMC survey of engineers in the paper industry. However, these two surveys are not from the same database—or the same year—and comparison may be misleading. The EMC survey reported a median income of $41,250 for engineers who are also supervisors, and $30,490 for nonsupervisory engineers. Median income for *P&P* survey respondents with no supervisory responsibility is $36,000, and $40,000 or more for respondents supervising at least one employee (see Table 16). Again,

TABLE 4: **Compensation and type of employment organization.**

Employing organization	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Median benefits	Respondents (%)
Academic	30	30	39	39	50	4	0.2
Government	0	0	32	34	35	2	0.4
Wood/pulp/paper—engineering	30	34	41	50	61	6	14.8
Wood/pulp/paper—manufacturing	28	33	41	51	64	8	64.6
Consulting firm	33	41	50	59	70	5	6.1
Self-employed consultant	27	34	42	45	48	4	0.5
Wood/pulp/paper—supplier	30	37	45	56	65	7	6.6
Wood/pulp/paper—converter	28	32	40	53	63	10	2.5
Other	31	36	41	54	63	8	4.1

TABLE 6: **Compensation and size of employing organization.**

Organization's annual sales ($ million)	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Median benefits	Respondents (%)
Less than 100	30	35	45	58	68	6	13.3
100 to 499	28	33	41	50	65	6	18.9
500 to 999	28	35	43	54	70	8	12.0
1,000 to 2,000	28	33	41	50	59	8	19.6
Over 2,000	30	35	43	53	65	8	29.1
Do not know	24	29	37	42	50	4	7.1

comparision of the two surveys is difficult, especially since *P&P* survey respondents include some supervisors who are not engineers.

Not surprisingly, the highest median income ($50,000) was reported by respondents whose main work function is administration. Salaries in sales and marketing ($48,000) and consulting ($47,000) followed close behind (see Table 5).

> "UNION WORKERS tend to be favored at the expense of the salaried force."
> —Technical service engineer, Southeast

Table 7 shows that the median income of respondents directly corresponds to their level of supervisory responsibility—with corporate level management again topping the list.

Those respondents who reported consulting firms as their employment organization (Table 4) showed the highest median income at $50,000. Suppliers to the industry came in second highest at $45,000.

Survey data showed no noticeable difference in median income or benefits between geographic regions in the U.S., and that breakdown is not included in this report. However, the median income of all Canadian respondents (3.6% of all respondents) was US$38,000.

No clear trend can be inferred from Table 6, which relates median income to the employing organization's annual sales, except that apparently those respondents who work for small companies make the most money, and those who do not know the amount of their companies' annual sales make the least.

The one major surprise of this survey is shown in Table 9. Respondents with bachelor's degrees in liberal arts lead all other disciplines in median income at $45,000. But, before anyone's ego is severely deflated, it should be noted that liberal arts respondents represent only 3.3% of all respondents. Therefore, this data may be misleading—or at least the deans of all those engineering schools out there hope so!

Three engineering disciplines—mechanical, chemical, and electrical—were tied with business for the second highest median income ($43,000).

Table 8 shows that median income increases with professional experience through 29 years of experience. However, past that point median income actually decreases. This phenomenon may possibly be explained by salary compression; i.e., salaries of recent graduates and young employees increase faster than those of older, more experienced personnel. And, in fact, several older

TABLE 5: **Compensation and principal work function.**

Principal function	**Income ($1,000)** Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Median benefits	Respondents (%)
Administration	32	39	50	67	93	8	9.7
R&D	28	32	41	52	63	6	11.5
Consulting	31	40	47	55	65	7	4.6
Engineering design	30	35	41	50	60	5	15.7
Teaching/academic	30	30	30	42	42	0	0.1
Product development	28	29	40	50	55	10	2.1
Production and mill/plant operations	30	35	43	55	68	7	17.1
Engineering/maintenance	28	32	39	46	55	5	9.1
Sales and marketing	32	38	48	60	72	10	8.3
Technical service/quality control	26	29	36	43	50	7	14.4
Other	26	32	41	53	65	8	7.4

TABLE 7: **Compensation and level of supervisory responsibility.**

Supervisory responsibility	**Income ($1,000)** Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Median benefits	Respondents (%)
None	25	28	33	42	51	5	13.6
Indirect or staff	28	31	37	45	54	6	21.7
Team or unit	29	33	39	44	53	6	14.1
Project or section	29	35	42	52	58	7	20.0
Major department or division management	35	41	50	60	75	9	25.3
Corporate management of organization	40	48	64	91	125	12	5.3

survey respondents did comment on this salary compression problem.

Job hopping apparently does pay, according to Table 13. Respondents who have had five full-time employers in their careers have a median income of $49,000, compared with $37,000 for respondents who have had only one employer.

The majority of respondents seem to have done at least a little job hopping since 67.4% have had more than one employer. Salary compression or other factors may explain the drop to a $42,000 median income for those who have had six or more employers.

RESPONDENTS COMMENT. The survey form included a space for comments, and many interesting ones on several issues were received. The overriding theme of many comments was that, "although working conditions and job satisfaction are still decent, things will be better when the industry is completely recovered from the recession."

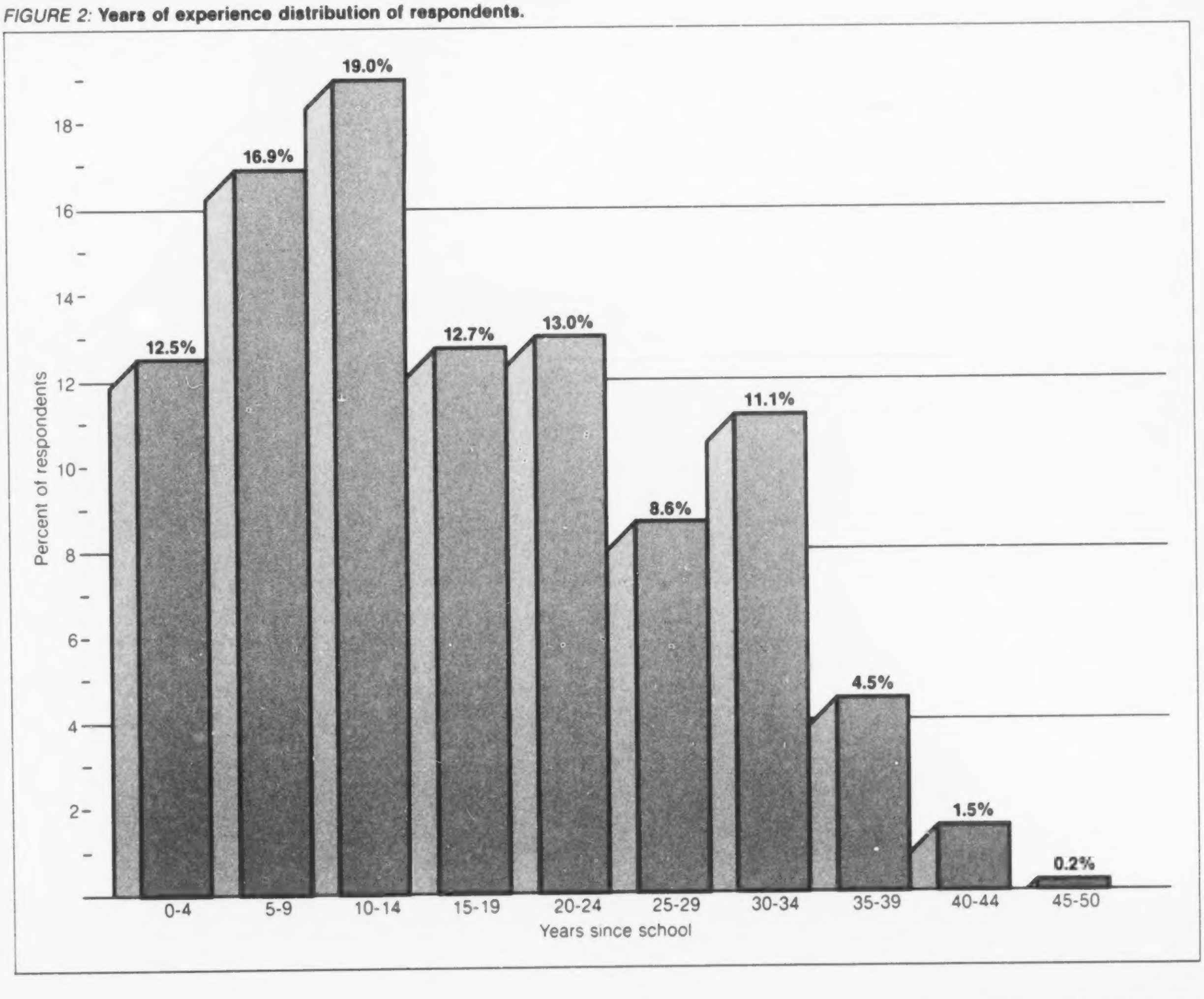
A chemical engineer working in mill operations in the Southeast summed up the feelings of many respondents by saying, "Today I have about double the responsibility and authority of two years ago but only 4% more salary. The bonus program is frozen, so my net pay is less." This respondent went on to address the major concern voiced by many respondents who reported low job morale. "Meanwhile, the hourly people's pay has increased 24% over the past two years, and they are ahead of both me and my supervisors. I hope this situation is corrected soon."

This particular concern is not new to the current recession—especially among production supervisors in the industry—but it was voiced by many of our readers who said they are unhappy because they have had their salaries and benefits cut or frozen recently, while hourly workers at their companies continued to receive pay in-

TABLE 8: **Income and professional experience.**

Years since school	Median income ($1,000)	
	All respondents	Respondents (%)
0 to 4	29	12.5
5 to 9	35	16.9
10 to 14	41	19.0
15 to 19	46	12.7
20 to 24	50	13.0
25 to 29	51	8.6
30 to 34	48	11.1
35 to 39	50	4.5
40 to 44	53	1.5
Over 44	36	0.2

FIGURE 2: **Years of experience distribution of respondents.**



creases according to union contracts.

A pulp and paper technology graduate working in technical service at a southeastern mill said, "Union (hourly) workers tend to be favored at the expense of the salaried force. In some areas, the salaried supervisor makes less than the hourly people he supervises. Also, hourly workers received a 7% raise this year while salaried workers had a freeze."

A civil engineer in engineering/maintenance at another southeastern mill commented,"My current morale and outlook are poor. Current market and economic conditions have caused my employer to ask for more work at the same pay. Sacrifices by salaried employees have not been rewarded, while union workers have continued to demand and receive increases in both wages and benefits."

A mechanical engineer in the Midwest noted, "Management treats the union with kid gloves." Similar comments were received from respondents in many different disciplines and geographic areas.

Of course, not all the comments received were negative. A vice president of production for a midwestern

TABLE 9: **Income and educational field (Bachelor's degree only).**

Discipline	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	Respondents (%)
Forestry/agriculture	24	32	40	49	58	3.6
Chemistry	28	33	40	50	60	14.5
Mechanical engineering	31	36	43	55	66	18.6
Chemical engineering	29	34	43	53	64	17.3
Civil engineering	30	35	40	51	63	4.6
Electrical engineering	31	35	43	54	62	7.0
Industrial engineering	32	37	41	52	58	2.6
Mathematics/physics	30	36	40	50	54	1.8
Computer science	23	23	42	42	50	0.2
Biology/life science	25	25	34	42	49	1.3
Paper science and technology	27	30	38	47	64	13.5
Environmental science	26	41	42	46	46	0.5
Business	30	33	43	54	71	7.1
Liberal arts	30	44	49	68	98	3.3
Other	30	35	45	52	55	4.0

TABLE 10: **Income, professional experience, and educational level.**

Years since school	Highest degree	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile
0 to 4	B.S.	28	28	31	33	36
	M.S.	28	34	37	38	40
	Ph.D.	26	28	32	36	46
5 to 9	B.S.	27	32	36	41	45
	M.S.	35	37	42	45	54
	Ph.D.	34	37	47	51	57
10 to 14	B.S.	32	35	42	47	55
	M.S.	38	40	50	57	65
	Ph.D.	32	36	41	48	53
15 to 19	B.S.	36	41	46	58	60
	M.S.	30	48	52	60	71
	Ph.D.	37	40	52	56	55
20 to 24	B.S.	36	42	49	52	64
	M.S.	24	46	55	65	91
	Ph.D.	37	47	52	60	88
25 to 29	B.S.	42	51	58	65	84
	M.S.	39	39	52	57	69
	Ph.D.	42	50	57	70	87
30 to 34	B.S.	31	43	48	63	66
	M.S.	44	49	54	62	73
	Ph.D.	40	40	65	68	74
35 to 39	B.S.	36	36	56	64	80
	M.S.	48	48	50	60	78
	Ph.D.	0	0	0	0	0

pulp and paper company wrote, "I think paper is the best industry you can get into. There will always be work and opportunity for anyone who wants it. The sky is the limit!"

A purchasing manager for a southeastern pulp and paper company with an income of $75,000/year says, "I have the best job in the industry. I could not be treated any better than I am."

> "THERE IS DEFINITE discrimination against older employees. They receive . . . demotions without regard for seniority. . . ."
>
> —Mechanical engineer, Northeast

A few of our older readers voiced their concerns about salary compression and age discrimination. One chemistry major currently working at the northeastern corporate headquarters of a pulp and paper company said, "There is definite discrimination against older employees. They receive lateral shuffles and demotions without regard for seniority or experience."

A mechanical engineer who is employed at another northeastern pulp and paper company summed up a predicament that may be typical for many older employees who are dissatisfied with their present job. "I'm too old to make a change. You reach a point in life where you can't afford to move because of pension, insurance, etc. It's a living; better than unemployment. You do the best job you know how for personal satisfaction."

We also heard from a few of our female readers about their particular problems. One female R&D engineer in the Northeast with a masters degree in pulp and paper technology said, "This is a tough industry for women! I'm not interested in being 'one of the boys' yet then it's difficult to be taken seriously."

A female biology/life science major employed in technical service at a northwestern mill noted, "We need more women in the industry."

PRINTER ERROR. Apparently, due to printer error, some readers did not receive a tear-out survey form or postage-paid envelope in their September issue of *P&P*. We apologize for this error and thank those readers who mailed in surveys in spite of this inconvenience. This survey will be repeated in 1984, probably in the August issue, and we look forward to hearing from all of

TABLE 11: **Income, professional experience, and educational field (Bachelor's degree only).**

Years since school	Income ($1,000) Forestry/ agriculture	Chemistry	Mechanical engineering	Chemical engineering	Civil engineering
0 to 4	30	29	30	28	30
5 to 9	24	36	35	35	35
10 to 14	39	39	41	44	39
15 to 19	35	42	48	50	51
20 to 24	44	43	50	53	48
25 to 29	48	44	61	50	59
30 to 34	46	50	50	51	49
35 to 39	75	53	56	52	57
40 to 44	53	92	50	55	0
Over 44	0	0	27	0	0

TABLE 12: **Income and number of years with current employer.**

Years	Median income ($1,000)	Respondents (%)
5 or less	34	11.3
6 to 10	34	17.0
11 to 15	34	21.0
16 to 20	37	16.7
21 to 25	40	15.9
26 to 30	39	10.2
31 or more	41	7.7

TABLE 13: **Income and number of full-time employers.**

Employers	Median income ($1,000)	Respondents (%)
1	37	32.6
2	42	31.0
3	42	18.0
4	46	9.0
5	49	5.7
6 or more	42	3.7

TABLE 14: **Income and type of wood/pulp/paper company.**

Type	Median income ($1,000)	Respondents (%)
Wood products	39	2.6
Pulp/paper/ paperboard	39	61.6
Woodlands operations	31	2.4
Chemical byproducts	42	0.8
Corporate or administration	48	19.1
R&D	41	13.5

our readers then.

Reader comments or suggestions on how the survey can be improved are always appreciated. Comments can be sent to:

Kenneth E. Smith, Executive Editor, Pulp & Paper,
2700 Cumberland Parkway N.W., Suite 530,
Atlanta, Ga. 30339. ■

> *"I THINK PAPER is the best industry you can get into. There will always be work and opportunity for anyone who wants it. The sky is the limit!"*
>
> *—Vice president of production, Midwest*

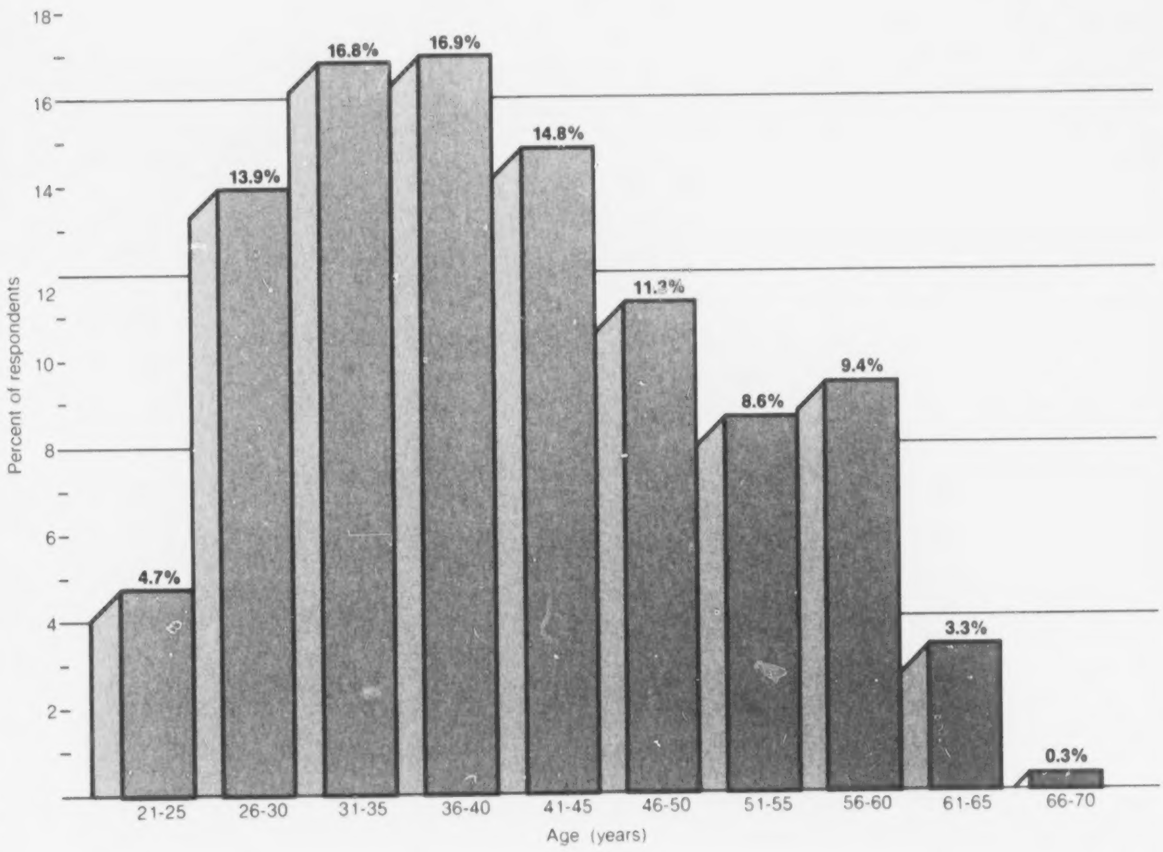
TABLE 15: **Income and number of years management experience.**

Years	**Median income ($1,000)**	**Respondents (%)**
None	32	11.7
5 or less	37	15.7
6 to 10	40	13.9
11 to 15	38	12.3
16 to 20	42	17.6
21 to 25	45	10.7
26 to 30	46	8.4
31 or more	44	9.8

TABLE 16: **Income and number of employees managed.**

Employees	**Median income ($1,000)**	**Respondents (%)**
None	38	24.1
1 to 5	40	23.8
6 to 20	40	21.4
21 to 50	41	17.3
More than 50	42	13.4

FIGURE 3: **Age distribution of respondents.**



ISSUE FOCUS:
Mill Maintenance

Dynamic pump seals reduce mill's bearing losses, maintenance costs

Replacing packed stuffboxes with dynamic seals has virtually eliminated pump failures at Weyco mill; little maintenance is required

By BRUCE HOFFENBECKER

■ Considering how long centrifugal pumps have been in use, it is surprising that most are still sealed with packed stuffboxes. Packing a pump requires both skill and knowledge to obtain the maximum life from both the packing material and the shaft sleeve. Conventional packing requires too much maintenance time and money, but the lack of it can be just as disastrous. Failure of bearings due to gland water or product leakage along the shaft into the bearing frame housing (with subsequent contamination of the lubricant) is the usual result of packing failure. Frequent readjustment of both the gland and the gland water is necessary to minimize product leakage and dilution.

Mechanical seals are also used on centrifugal pumps. These devices, installed in the stuffing box, have two sealing faces. One is held stationary by the stuffbox and the other is secured to the shaft and rotates along with it. The sealing faces are finely lapped and kept in contact by compression springs, thus preventing leakage. Because of the precision involved in their manufacture, these seals can be very expensive. This relatively high cost is also due to the material used for the sealing faces. Carbon used with ceramic is the most common and cheapest material and tungsten carbide is the most expensive. Precise installation of mechanical seals is critical to prevent premature failure. Even properly installed mechanical seals can fail without warning.

Certain conditions directly affect the life of a seal, whether a packed stuffbox or a mechanical seal. Proper alignment of the pump's coupling is a must. Shaft runout at the seal area should not exceed 0.002 in. as the radial motion will cause excessive wearing of the seal faces. The same radial motion will deform conventional packing, in either case leading to premature seal failure. Operating to either side of the best efficiency point on a pump curve causes increased shaft deflection with the same radial motion effects. Axial motion from a loose thrust bearing fit or misalignment can cause premature mechanical seal failure. Gland or flush water must be properly applied to each seal when pumping slurries.

Where these methods of sealing are not adequate, a method known as dynamic sealing can be used. Although not a new technology (Allis-Chalmers Corp. had its Equiseal on the market in the 1940s), it is one being rejuvenated in view of environmental concerns, energy costs, product costs, and effluent treatment costs, not to

TABLE 1: **Average annual cost comparisons of titanium dioxide pump (30% solids).**

	Packed stuffbox	Dynamic seal
Effluent treatment	$ 750	$ 0
Bearing frame rebuild	650	0
Packing costs (material)	75	0
Sleeve costs	250	100
Replace lip seal	0	100
Seal water	200	0
Product loss	15,000	75
Millwright labor	1,000	150
Housekeeping labor	500	25
Oiler labor	500	25
Totals	$18,925	$475

TABLE 2: **Average annual cost comparisons of paper stock pumps (1.5% to 5% consistency).**

	Packed stuffbox	Dynamic seal
Effluent treatment	$2,100	$ 5
Bearing frame rebuild	850	0
Packing costs (material)	100	0
Sleeve costs	350	0
Replace lip seal	0	0
Seal water	550	15
Product loss	500	0
Millwright labor	1,000	0
Housekeeping labor	500	0
Oiler labor	500	30
Totals	$6,450	$50

Mr. Hoffenbecker is senior maintenance engineer, Weyerhaeuser Co., Rothschild, Wis.

mention maintenance costs. These seals are available from several pump manufacturers for pumping chemicals, slurries, pulp and paper stock, and many other liquids. They come in one, two, or even three stages to seal against static suction heads up to 140 ft (at 3,500 rpm).

DYNAMIC SEALING. A dynamically operated seal in a centrifugal pump (see Figure 1) uses an auxiliary radial van impeller, often called an expeller or repeller in a modified stuffbox. When in operation, the auxiliary impeller rotates along with the main pump impeller, its centrifugal forces acting against the static suction head of the liquid in the stuffing box area as well as back pressure developed by the impeller. This creates an equilibrium point and prevents leakage.

After the pump is shut down, a static seal is employed. Several types of static seals are available, depending on the options offered by each manufacturer of dynamic seals. These options include the mechanical seal, use of the flyweight principle, packed stuffbox, and the lip seal.

Mechanical seal. A mechanical seal used in this application would function when the pump is shut down. On startup, pneumatic or hydraulic pressure is applied to built-in seal bellows that open the sealing faces, thus minimizing face wear. When the pump is shut down, the pressure is relieved and the mechanical seal faces close.

The main advantage of this type of static seal is its ability to virtually eliminate product leakage. However, disadvantages may outweigh the advantages, depending on the liquid being pumped. Use of a bellows-operated mechanical seal requires an air or hydraulic supply, filter, regulator, solenoid valve, delay timer (optional), and an electric hookup to the motor starter. These requirements, along with the cost of a special mechanical seal, result in a relatively major expense plus maintenance costs incurred later on. In addition, liquids with heavy solids (slurries) can set up in the mechanical seal area while the pump is shut down, causing accelerated wear on startup.

Flyweight principle. This type of static sealing utilizes the centrifugal forces of a flyweight mechanism to open sealing faces on startup and close them on shutdown. The result is an excellent static seal. The main disadvantage is cost, along with maintenance to rebuild the pins and linkages of the flyweight mechanism. Guarding of the rotating flyweights is essential to safety.

Packing rings. This conventional means of sealing is very basic. It requires an external source of water for packing cooling and lubrication, which can cause product dilution, leakage, and eventually lead to lubrication contamination and bearing failure. Furthermore, some of the recommended packing material can cost as much as $100/lb or more.

Lip seal. A lip seal, usually of special design, is the simplest and most economical means of static sealing. It requires no external source of air, water (except on some paper stock applications where it is recommended to prevent stock dewatering within the seal area), or electricity. Both radial lip and axial contact seals are available. The radial lip seal usually wears more quickly, necessitating periodic inspection and/or replacement.

MILL APPLICATIONS. At Weyerhaeuser Co.'s pulp and paper mill at Rothschild, Wis., 31 pumps (16 process and 15 paper stock pumps) fitted with dynamic seals have accumulated over 50 pump-years of operation.

Most of these pumps were modified with dynamic seal kits, some installed in as little as 2.5 hours. All are equipped with static lip seals (stock pumps use a polished rotating collar against a stationary axial contact rubber seal), and all but one are single-stage seals.

A pump handling titanium dioxide (30% solids) and previously equipped with a standard stuffbox required constant maintenance. Packing was being replaced about every two to four weeks, with readjustment every other day. Shaft sleeves were being replaced about every four to six months, and bearings had to be replaced about as often due to lubrication contamination from gland leakage. Maintenance and housekeeping costs totaled more than $5,000/year, while product losses were

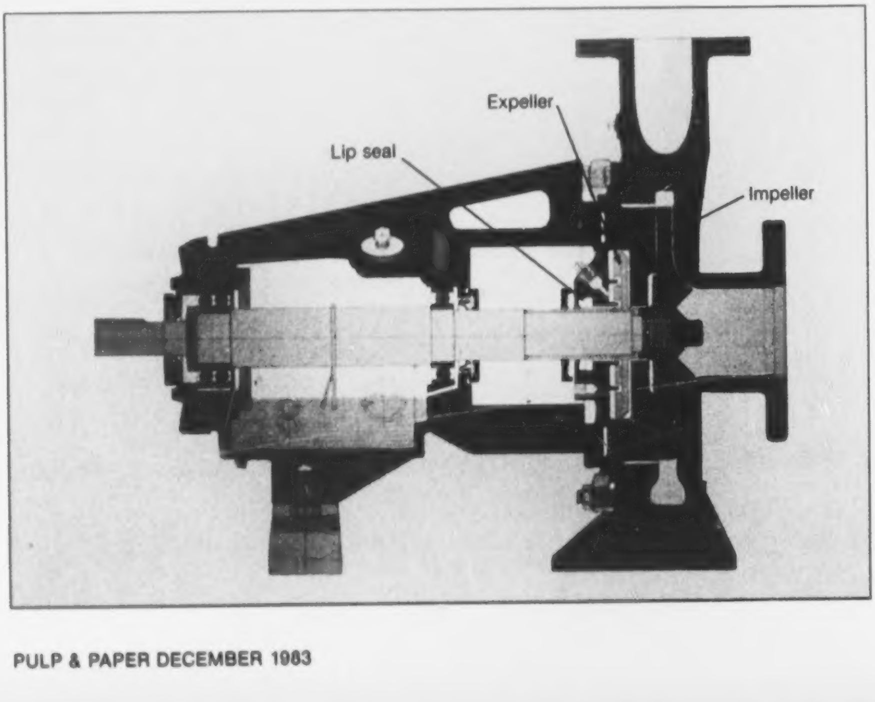


FIGURE 1: **Process pump with single-stage dynamic seal.**

TABLE 3: **Average annual cost comparisons of process pumps.**

	Packed stuffbox	Dynamic seal
Effluent treatment	$ 950	$ 10
Bearing frame rebuild	640	80
Packingcosts (material)	60	0
Sleeve costs	240	10
Replace lip seal	0	30
Seal water	300	5
Product loss*	2,000	15
Millwright labor	900	40
Housekeeping labor	480	0
Oiler labor	500	20
Totals	$6,070	$210

*Includes TiO_2 pumps.

estimated at more than $15,000. Even greater product losses occurred with another pump handling titanium dioxide at 70% solids.

Both pumps have been in continuous operation for two years since being equipped with dynamic seals. Product leakage has been almost nonexistent, no product dilution has occurred, and maintenance costs have been substantially reduced. The only required maintenance has been to change the static lip seals twice on each pump due to the abrasiveness of the titanium dioxide. Plugging has occurred on three occasions—once due to a power failure, once due to a faulty suction valve that allowed the product to enter the pump and seal area after the pump was shut down and flushed, and once due to a failure to flush the pump after a shutdown.

Other process pumps are handling clay, lime, and starch slurries, along with whitewater. A pump that handles a starch slurry at 125°F has been operating continuously for three years without any leakage and with no maintenance performed. Prior to installation of the dynamic seal, maintenance costs alone were estimated at more than $3,000/year, not counting product losses. These were estimated at another $3,000+/year.

The paper stock pumps, which handle consistencies up to 5%, have accumulated more than 18 pump-years of operation with no maintenance performed on any of the seals. These pumps, however, are supplied with 3 to 5 gal/hour of gland water to prevent stock from dewatering within the seal area and plugging the expeller vanes. The savings in effluent treatment, maintenance, and housekeeping costs average to over $5,000/year/pump, not including product losses.

Since dynamic seals have been installed, no bearings have been lost due to failure of the dynamic seal. Routine pump maintenance, such as tightening packing glands, draining water out of the lubricant as a result of gland leakage, cleaning up paper stock or other product loss from the floor area, repacking pumps, overhauling pumps (i.e., changing sleeves, bearings, etc.), and readjusting gland water valves to minimize gland water and product losses, is no longer required on those pumps equipped with dynamic seals. In fact, the only necessary maintenance performed, other than unplugging, has been the replacement of eight lip seals—half of these on the two titanium dioxide pumps—in more than 50 pump-years of operation. ■

STONE CONTAINER DOUBLES CAPACITY

(Continued from page 67)

vate landowners and investing its capital in manufacturing facilities. "We think the return from manufacturing operations is higher than from timber ownership—unless that land was purchased a long time ago," Mr. Stone asserts.

Continental will supply its former brown fiber mills with timber over the next five years at the same rate that they were supplied on average over the past three years. For the next five years after that, CFI has agreed to supply its former mills at a 20%/year declining rate—for a total commitment of ten years. A similar agreement has been reached regarding woodchips from Continental's sawmills, and Stone Container has right of first bid on CFI's timberland and sawmills, if they are ever put up for sale.

HOW THE DEAL WAS FINANCED. A portion of the $510-million purchase price for the CFI operations was paid by assumption of about $120 million of long-term debt, of which $114 million is represented by tax-exempt obligations with a weighted-average interest rate of about 6%. Those obligations have only nominal scheduled principal payments for the next few years, with principal amortizations extending as far as the year 2016. The balance of the purchase price was paid in cash at the closing. The transaction includes the transfer to Stone Container of net working capital related to the acquired operations.

"Stone Container financed the transaction by means of a $600-million credit facility arranged with a group of banks," explains Arnold F. Brookstone, senior vice president, chief financial and planning officer. The bank financing consists of a $400-million, 7.5-year term loan, with no principal payments until September 1986, and a $200-million, 2.5-year revolving credit. The revolving credit is convertible, at the company's option, into a 5-year term loan, whose period coincides with the last 5 years of the $400-million loan. "At appropriate times and under favorable market conditions, we plan to fund a portion of the bank financing through the issuance of equity and other securities," according to Brookstone.

"Our financing plan is conservative and provides the company with essential financial flexibility and staying power," Brookstone states. He estimates capital spending over the next two years will total only about $70 million because both Stone Container and CFI have continuously invested in modernizing their plants.

Earlier this year Stone Container raised $37.5 million through its first equity offering since going public in 1947, reducing the Stone family's holdings in the company from 57% to 49%. The company also hired its first president from outside the Stone family, James E. Frew, group vice president of Georgia-Pacific Corp.

Mr. Stone declined to discuss how CFI's management would be combined with Stone Container's but notes that "a lot less restructuring will be required than most people expect. We are excited about the Continental people joining the company and look forward to significant future growth." ■

TiO_2 consumption improves but imports still rising

By BARRY SHOCKETT

Although titanium dioxide (TiO_2) production fell to 650,000 tons in 1982, about 30,000 tons more than originally predicted, the economic recovery this year is expected to boost output to near the 1980 figure. However, imports are forecast to grow more than 18% in 1983 (see below), following an 11% increase last year. Combined shipments from Canadian and European sources made up 19% of total demand in 1982 and could easily reach 20% this year.

U.S. statistics for titanium dioxide (000 short tons)

	1980	1981	1982	1983e
Capacity	1,000	1,005	950	905
Production	727	750.5	650	725
Imports	98	125	139	165
Exports	42	61	68	80
Apparent consumption	783	814.5	721	810

Source: Bureau of Census, U.S. Dept. of Commerce.

Canadian statistics for titanium dioxide (000 short tons)

	1980	1981	1982	1983e
Capacity (nameplate)	79.4	82.7	82.7	82.7
Production	78.8	78.8	79.4	82.7
Imports	6.9	8	7.1	8.8
Exports	14.3	15.4	22	24.3
Apparent consumption	71.4	71.4	64.5	67.2

TITANIUM DIOXIDE

UNITED STATES

Uses: Rutile and anatase grades of TiO_2 are used as fillers and coating pigments by the paper industry in printing/writing papers and paperboard. The largest end use is in paints (50%), followed by plastics (12%), rubber, ceramics, and various other applications.

Demand: In 1982, the paper industry consumed an estimated 172,000 tons—off 6% from the previous year—accounting for almost 24% of total TiO_2 demand. Recovery of both coated paper and paperboard from last years' poor performance resulted in overall industry usage increasing to an estimated 190,000 tons in 1983.

Sources: The remaining five U.S. producers, in declining order of capacity, are: E.I. DuPont, SCM, American Cyanamid, Kerr-McGee, and Gulf + Western. SCM strengthened its number two spot by acquiring G + W's Ashtabula, Ohio plant, which it intends to expand approximately 22%. Kerr-McGee's Hamilton, Miss., facility is also undergoing an expansion due to be completed in next year's third quarter. G + W's remaining plant in New Jersey is reportedly up for sale.

Availability: No shortage of TiO_2 is anticipated in the foreseeable future, as operating rates remain at the 80% level. 1983, market; 1982, market; 1981, market; 1980, market; 1979, anatase, market; rutile, tight.

Pricing: List prices for both anatase and rutile grades were steady throughout 1983, although selling prices were down between 10¢-15¢/lb for most of the year. However, one producer introduced a 1.5¢/lb boost on market prices for the fourth quarter and announced plans for quarterly hikes until mid-1984, the amounts to be decided by the marketplace. Pricing history: 1983, anatase, 70¢/lb, delivered; rutile, 75¢/lb; 1982, anatase, 70¢/lb; rutile, 75¢/lb; 1981, anatase, 58¢-70¢/lb; rutile, 63¢-75¢/lb; 1980, anatase/rutile, 57¢/lb; 1979, anatase, 53¢/lb; rutile, 59¢/lb; 1978, anatase, 46¢/lb; rutile, 52¢/lb.

Forecast: Demand for TiO_2 is expected to continue to improve both domestically and on a worldwide basis. Offshore improvements should result in a drop in imports, which in 1983 were predicted to reach an all-time high of 165,000 tons.

CANADA

Uses: About 90% of the anatase TiO_2 used by the paper industry is used by fine paper mills, with paperboard applications accounting for the rest. The paint industry is the largest dioxide consumer (57.5%), followed by plastics (16%), and rubber and miscellaneous (14%).

Demand: Paper industry usage in 1982 was 7,700 tons (as predicted), 500 tons more than in the previous year. In 1983, mill consumption should rise about 7%, to 8,300 tons—12% of total TiO_2 demand. In 1983, imports are expected to be close to 9,000 tons, compared with the 7,000 tons last year.

Sources: The two domestic producers are NL Chem Canada and Tioxide Canada. In 1982, 54% of the imports (11% of total demand) were from the U.S., the balance coming from Europe.

Availability: Despite the high operating rate of close to 100%, any increased domestic demand could be satisfied by reducing exports until new capacity comes on stream. 1983, anatase, market; 1982, market; 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: List prices for untreated anatase have remained steady since January 1982. A 2¢/lb discount was applied in February this year, slated for removal in the third quarter. Pricing history: 1983, 80¢/lb, bags, delivered; 1982, 74.5¢-80¢/lb; 1981, 69¢-74.5¢/lb; 1980, 59¢-69¢/lb; 1979, 48.5¢-59¢/lb. Slurry shipments are 0.5¢/lb extra.

Forecast: TiO_2 demand by the paper industry is forecast to increase on average 8%/year until 1987, while dioxide consumption will grow between 7.5% to 8%/year during the same period.

Mr. Shockett is consulting editor-chemical markets for Pulp & Paper.

NOTE

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Cov. 1, p. 3, 5, 9, 13, 33,

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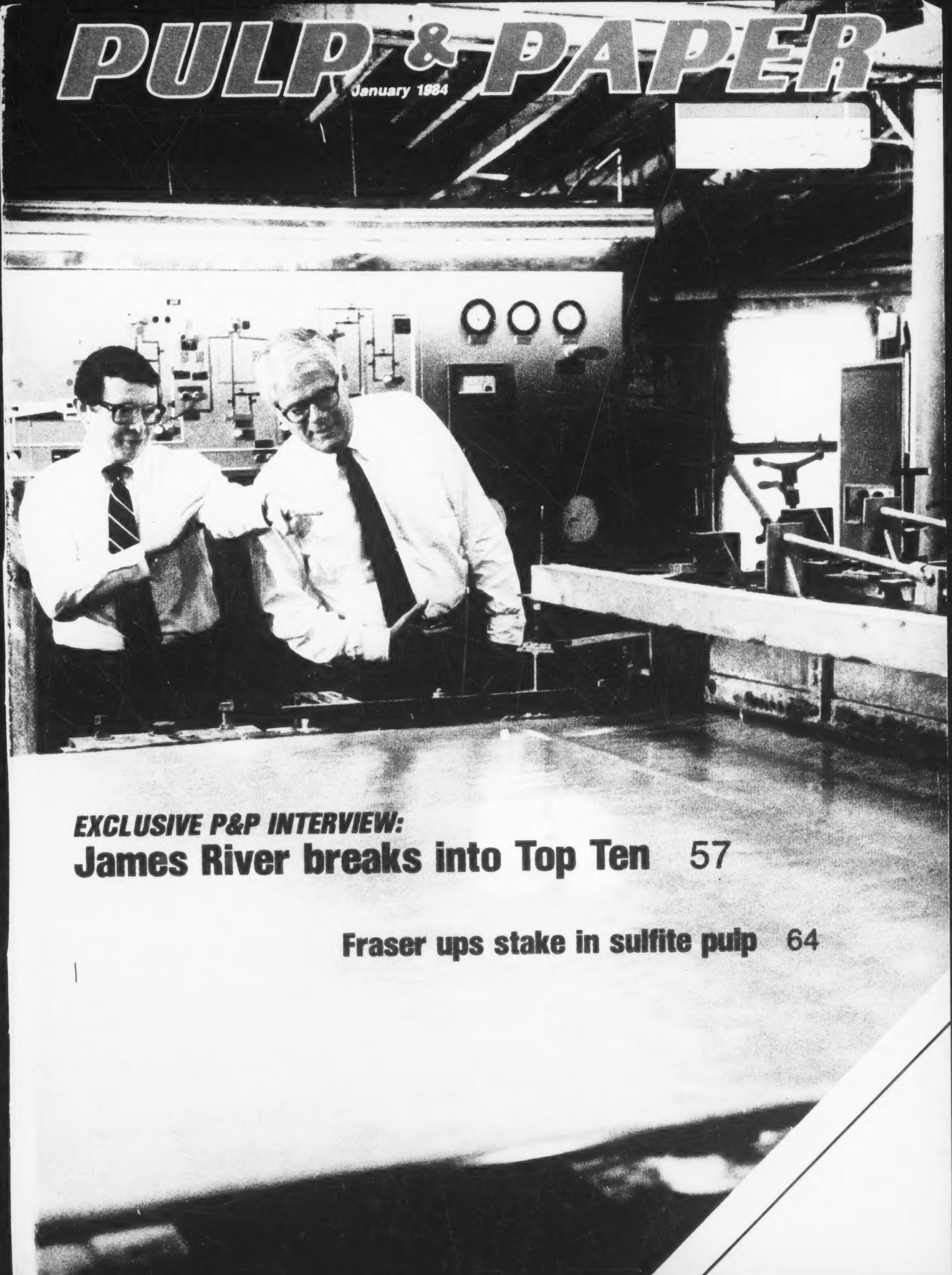


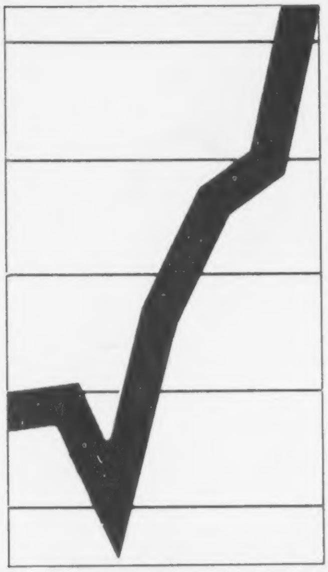
EXCLUSIVE P&P INTERVIEW:

James River breaks into Top Ten 57

Fraser ups stake in sulfite pulp 64

PULP&PAPER

Volume 58 Number 1 January 1984



OUTLOOK 84: RECOVERY 74

ISSUE FOCUS: OUTLOOK 84

74 **Strong U.S. pulp/paper industry recovery** seen continuing in 1984; forecasts for coated paper, uncoated free sheet, containerboard, boxboard
82 **Canadian industry:** Light at end of tunnel may be real in '84 after all; newsprint recovering, uncoated groundwood enjoying LWC's coattails
89 **Wastepaper:** Market rebound to continue
90 **Labor:** Bargaining to focus on eastern Canada
92 **Pulpwood:** Recovery ups demand, slows price hikes
93 **Energy:** More moderation expected in fuel costs

123 **CAPITAL SPENDING:** *P&P*'s annual survey of U.S./Canadian pulp and paper firms' spending plans for 1983-85 shows emphasis on incremental capacity expansion, improved energy use

COVER STORY: James River

57 **Exclusive *P&P* interview:** James River's Brenton S. Halsey and Robert C. Williams discuss their management philosophy, labor relations, and future growth strategy

Expansion/Modernization

64 **Fraser's commitment to sulfite pulping** continues with major rebuild of Atholville, N.B., mill; project follows a similar modernization at Edmundston, N.B., in 1979

Mill operations

112 **Naval stores industry in a slump;** speakers at the 10th Annual International Naval Stores Conference detailed the industry's woes
131 **Automated starch enzyme conversion system** at Mead, Escanaba, is economical, trouble-free, and gives consistent paste quality

Process automation

103 **Millwide control system** uses single operator station to integrate all plant data acquisition, control and testing for improved efficiency
105 **Personal computer system** becomes cost-effective engineering tool for MB technical department; mill plans to expand network
107 **Online color measurement system** gives reliable, cost-effective information at several paper mill installations in U.S., Europe

Table of contents continues on page 5

INTERVIEW: JAMES RIVER 57

***COVER:** James River's Robert C. Williams (left) and Brenton S. Halsey check the operation of an 1880's-vintage blotter paper machine at their 26-tpd Hollywood (Richmond, Va.) mill. This mill was the foundation from which they built James River into a $2-billion/year giant. An exclusive interview with Halsey and Williams begins on page 57.*
(Photo courtesy of James River.)

DOMTAR TO SPEND C$773 MILLION 25

LUKE COMMENTS 210

News

9 **Month in Statistics** —U.S. paper and paperboard production

11 **Marketing Roundup** —White paper prices still rising; Europe may hold back pulp hike; another price hike for containerboard

13 **Grade Profile** —Linerboard: strong demand may mean 97% rates

25 **News Roundup** —**Expansions:** Domtar unveils C$773-million program; St. Regis considers new LWC machine

29 **Acquisitions:** Republic integrates into paperboard

31 **Labor:** B.C. industry makes unions 'final offer;' St. Regis mill up despite UPIU walkout

41 **International News:** Finnish mill ups groundwood grades; Haindl approves new paper machine; Japan 'structural plan' jeopardized

43 **Regulatory Roundup:** Senate panel, EPA reach water accord; OSHA unveils 'hazards' rule; acid rain bill put on back burner

Columns

7 **Editors' Notebook** —Outlook 84: Strong recovery to continue

45 **Washington Viewpoint** —The climate of opinion

145 **Career Development** —Keeping informed

153 **Maintenance Tips** —Expansion joints

197 **Chemical Markets** —Chlorine production and prices on upswing

210 **Industry Comment** —Commitment to the environment

Departments

47 **Conference Calendar**

147 **News of People**

157 **Product Showcase**

159 **New Products**

177 **Product Review**

181 **Current Literature**

193 **Book Shelf**

193 **Letters to the Editor**

195 **Finishing/Converting**

198 **Supplier News**

Services

155 **Readers Service Index**

161 **Readers Service Card**

201 **Jobs Wanted**

202 **Professional Service Directory**

204 **Classified Advertising**

208 **Advertisers Index**

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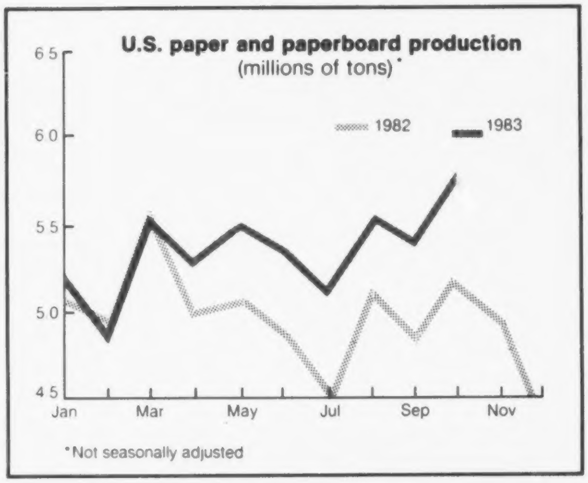
MONTH IN STATISTICS

U.S. paper and paperboard production in October totaled a record 5.83 million tons, up 12.2% from October 1982, according to the American Paper Institute. Both paper and paperboard production totals set new monthly highs in October, API added, with paper up 10.7% from last year and paperboard up 12.2%. The September-October two-month moving average of seasonally adjusted data moved up to a record 68.2 million tpy.

Among major grades, printing/writing papers are primarily responsible for record paper production. Production data now point to new records in 1983 for coated paper and uncoated free-sheet papers, with both up 10% from 1981 levels. Tissue, up 10.5%, and kraft packaging and industrial papers, up 7.3%, also showed continued strong growth in October. Paperboard production in October was up even more sharply than paper, with strong gains in every grade. Corrugated box shipments through October rose 11.7% over 1982, said the Fibre Box Assn.

Canadian newsprint shipments in October totaled 764,000 metric tons, a gain of 11.7% over October 1982, according to Canadian Pulp & Paper Assn. data. Newsprint mill operating rates stood at 88%, up from 79% last October.


U.S. paper and paperboard production
(millions of tons)*

*Not seasonally adjusted

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
[illegible]					
Newsprint	October	448	—	5,156	0.7
Uncoated groundwood (s)	October	142	2.9	1,502	2.8
Coated paper (s)	October	527	16.9	5,671	12.5
Uncoated free sheet (s)	October	767	13.8	8,676	10.3
Unbleached kraft packaging and industrial (s)	October	338	7.3	3,794	3.0
Tissue	October	420	10.5	4,777	8.0
Total paper	**October**	**2,939**	**10.7**	**32,827**	**7.5**
Kraft linerboard, unbleached	October	1,344	12.8	15,072	10.5
Semichemical medium	October	423	11.9	4,713	6.5
Bleached paperboard	October	348	14.1	3,904	5.0
Recycled paperboard	October	678	17.1	7,227	9.7
Total paperboard	**October**	**2,888**	**13.7**	**32,017**	**8.7**
Total paper and paperboard*	**October**	**5,827**	**12.2**	**64,844**	**8.1**
[illegible]					
Total woodpulp production	September	4,418	15.0	52,157	4.7
Market pulp production	September	533	23.7	6,414	10.1
Wastepaper consumption at paper/board mills	September	1,188	5.9	14,193	5.4
Pulpwood consumption (cords)	September	7,203	9.1	85,200	7.6
[illegible]					
Corrugated box shipments (billion ft²)	October	23.476	11.7	211.897†	6.8
Containerboard inventories at box plants	Oct. 1	2,339	−2.3		
[illegible]					
U.S. paper imports (including products)	September	741	12.8	8,696	9.5
Imports of Canadian newsprint	September	537	11.0	6,679†	3.6
U.S. paper exports (including products)	September	387	2.1	4,609	7.4
Exports of unbleached kraft linerboard	October	157	5.4	2,207	12.2
Exports of woodpulp	September	329	10.4	3,592	2.6
[illegible]					
Total newsprint shipments	October	764	11.7	6,952†	4.7
Operating rates	October	88%	79%	84%	83%
Inventories held by U.S. consumers	Oct. 31	1,260	−7.2		
Woodpulp shipments (export only)	October	575	45.9	5,549†	15.4
Operating rates	October	87%	75%	84%	78%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Linerboard: Strong demand, limited capacity growth may mean 97% rates

Statistics	**1982**	**1983e**	**1984e**
Production, 000 tons	13,494	14,860	15,985
Capacity, 000 tons	16,032	16,266	16,430
Utilization rates, %	84.2	91.3	97.3
Imports, 000 tons*	25	40	60
Exports, 000 tons*	1,819	2,120	2,300
Apparent U.S. consumption			
000 tons	11,700	12,780	13,745
lb/capita	100.9	109.3	116.3
000 tons/$billion real GNP	7.88	8.32	8.51

e=estimate *Commerce Dept. data

GRADE STRUCTURE: Unbleached linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26, 33, 69, and 90 lb. Major use is in domestic corrugated container production, although about 13% of output is exported. About 300,000 tons of recycled "test" liner is produced in the U.S. but is excluded from these figures.

PRODUCTION/CAPACITY: Unbleached kraft liner production rebounded with the U.S. economy in 1983, reaching a new high of about 14.86 million tons, up 10.1% from 1982. The surge reflected a sharp pickup in domestic box shipments and strong export demand despite the continuing strength of the U.S. dollar and slower economic recovery overseas.

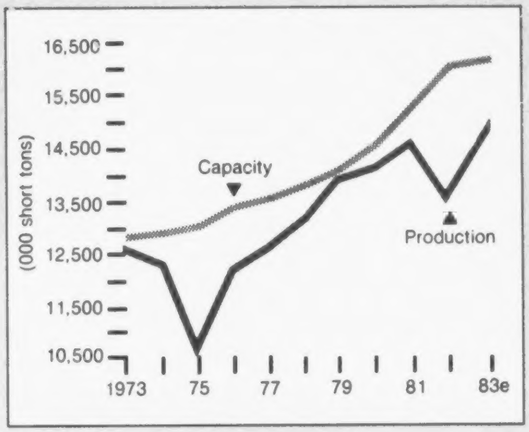
Corrugated box shipments in 1983 set a new record of around 252.1 billion ft², up 7.2% from the previous year and exceeding the previous peak of 250.6 billion ft² reached in 1979. U.S. export shipments of unbleached kraft liner in 1983 rose about 16.5% to 2.1 million tons.

The latest American Paper Institute survey shows linerboard capacity rising only 1.0% to 16.4 million tons in 1984 and by only 1.5%/year over the entire 1984-86 period, to 17.0 million tons. This includes a proposed new 280,000-tpy mill for which financing is still uncertain but excludes a new machine recently announced by Chesapeake Corp. of Virginia which will add about 83,000 tons in net capacity in 1986.

OUTLOOK: The outlook for kraft linerboard is bright in 1984, with production forecast to rise 7.6% to nearly 16.0 million tons and limited capacity expansion. This should result in operating rates of about 97% compared with 91% in 1983 and 84% in 1982.

Corrugated box shipments are forecast to rise 7.0% to 269.7 billion ft² this year, based on 7% to 8% growth in U.S. industrial production. This should translate into domestic liner demand of about 13.5 million tons in 1984. Linerboard inventories at box plants and mills are projected to drop 100,000 tons in 1984 following a nearly 200,000-ton drop during the past year.

Export shipments are projected to rise 8.5% to 2.3 million tons in 1984, with further strengthening of Western European and Far Eastern economies and some slight weakening of the U.S. dollar.



Estimated annual capacities of major U.S. companies are:

	Annual capacity[1] (000 tons)	**Capacity share** (%)
1. International Paper	1,527	9.4
2. Weyerhaeuser	1,410	8.7
3. Union Camp	1,340	8.2
4. Stone Container[2]	1,295	8.0
5. Champion International	930	5.7
6. Container Corp. of America	892	5.5
7 Temple-Inland[3]	780	4.8
8. Owens-Illinois	720	4.4
9. Great Northern Nekoosa	680	4.2
10. Westvaco	620	3.8
11. St. Regis	603	3.7
12. Packaging Corp. of America	575	3.5
13. Willamette Industries	540	3.3
14. St. Joe Paper	458	2.8
15. MacMillan Bloedel	445	2.7

1. Machines that can swing between producing linerboard and unbleached kraft paper make exact capacity estimates difficult.
2. Includes assets recently acquired from Continental Forest Industries.
3. Includes 50% share in Georgia Kraft Corp. jointly owned with Mead Corp.; all tonnage from the Phenix City, Ala., coated kraft board mill has been assigned to Mead.

Total U.S. capacity (1983): 16.266 million tons
Capacity share of top five companies: 40.0%
Capacity share of top ten companies: 62.7%

PRICING: Strengthening demand enabled the industry to implement two $20/ton price increases in 1983 to $270 in April and to $290 in September. The $290 price represented about breakeven for the industry, and producers were quick to take advantage of strengthening demand by announcing another $25 to $30/ton price increase for Jan. 1. (Year-end eastern U.S. transaction prices for 42-lb liner have been as follows: 1982, $250; 1981, $270; 1980, $270/$300; 1979, $270; 1978, $220; 1977, $195; 1976, $210; 1975, $202; 1974, 195; 1973, $145.)

Last spring the EEC imposed a minimum price of $333/metric ton ($302/short ton) on imports of U.S. heavyweight liner, and another increase to $365/metric ton has been announced for Jan. 1. Scandinavian producers have benefited from currency devaluations and upped market share.

(News section continues on page 25)

CAPITAL SPENDING

Cash woes slow capacity gains—API

Problems with cash flow experienced during the recession of 1981-83 curtailed capital expenditures and slowed down the capacity growth rate of previous years, said American Paper Institute senior vice president Norma Pace as the association's 1982-85 capacity survey was released.

Due to high interest rates, companies will have to generate more capital internally, she noted. API expects capital improvements in the industry will average about $6 billion a year during the 1984-86 period, compared to $3.5 billion ten years ago.

Total paper and paperboard capacity will rise during that time by 1.5% annually, reaching 74.1 million tons by 1986. This compares with advances of 2.3%/year experienced during the preceding 16 years. Pulp capacity will advance at the same 1.5% annual pace during the same period, rising to 58.7 million tons in 1986 from 56.2 million tons in 1983.

Capacity figures in the survey represent a compilation of more than 250 companies, representing 95% of all woodpulp and 90% of all paper and paperboard in the U.S. industry, according to API.

New machines will provide most of the new paper and paperboard capacity between 1984 and 1986. They will account for 52%, or 1.7 million tons, while improvements on existing machines, after removing the capacity of machines taken offline, will provide the remaining 1.6 million tons, the survey indicates.

Capacity increases in paper are expected to exceed the gains in paperboard, with the highest growth rate occurring in the printing and writing grades at 2.8%, followed by tissue at 2.3%. In the paperboard grades, unbleached kraft board will have the fastest growth in the packaging grades at 1.4% a year.

Pace attributed the healthy growth rate in printing and writing papers to the increased volume of communication papers, more business activity, and more use of computers and copiers.

"The evidence is getting stronger that the expanded use of information technology—at least at this stage—is demanding more paper," she noted.

Regional consumption. Industry's concentration continues to be highest in the South, and this trend is expected to continue, according to the survey results. Currently making up 53.0% of all paper and board capacity, the South's share is expected to grow to include 62.3% of all new capacity over the next four years. Of that share, southern woodpulp will account for 84.9% of the U.S. total, compared with 70.4% at present.

Both the Northeast and West will retreat from their current shares of total capacity for paper, paperboard and woodpulp. The Midwest will show a modest increase overall.

Raw material consumption. API expected a strong increase in raw material consumption in 1983 as the economy advanced, but there was a significant decline in 1982. Total fiber consumption declined in 1982 from the previous year by 5.9%, or 3.9 million tons, with woodpulp alone comprising 3.2 million tons of that drop. Recyclable paper was down 3.9%, or 597,000 tons, and other vegetable fibers fell by 143,000 tons.

Newsprint. The spurt in newsprint capacity growth by 40% in the past five years is expected to moderate now, said Pace. Capacity increases after 1983—when 225,000 tons were brought online—will amount to 231,000 tons.

Canadian newsprint mills, which presently supply an estimated 57% of U.S. needs, will raise capacity by 441,000 tons through 1986, according to the Canadian Pulp & Paper Assn.

Printing and writing paper. Net additions of printing and writing paper capacity will average 2.8% a year and total 1.5 million tons through 1986, surpassing the 1.9% annual growth rate forecast

(Continued on p. 35)

Growth trends in capacity

	16 year increase	Average annual growth	3 year increase	Average annual growth
Total paper & paperboard	**21,864**	**2.1%**	**3,274**	**1.5%**
Total paper	12,043	2.6	2,020	1.9
Newsprint	2,791	4.2	231	1.3
Printing/writing	7,039	3.1	1,554	2.8
Packaging & ind. conv.	518	0.6	(127)	(0.7)
Tissue	1,695	2.5	363	2.3
Total paperboard	9,921	2.1	1,250	1.2
Unbleached kraft	7,093	3.3	745	1.4
Solid bleached	832	1.4	155	1.2
Semichemical	1,648	2.4	97	0.6
Recycled	347	0.2	254	0.9
Total wood pulp	**17,197**	**2.2**	**2,494**	**1.4**
Dissolving & special alpha	33	0.1	—	—
Sulfite	(949)	(2.7)	(15)	(0.3)
Sulfate & soda*	15,377	2.9	2,139	1.7
Semichemical	860	1.3	72	0.5
Mechanical	1,876	2.4	299	1.7

*Includes screenings. ( )—loss.
Source: API

Regional distribution share of U.S. capacity changes 1983-1986

	Northeast	Central	South	West
Total paper & paperboard	**11.8%**	**17.5%**	**62.3%**	**8.4%**
Newsprint	—	—	79.6	20.4
Printing/writing	17.3	17.0	68.7	7.0
Tissue	20.3	48.0	24.5	7.2
Unbl. kraft (paperboard)	—	—	94.6	5.4
[illegible]	—	204.4	(164.2)	47.8
Total wood pulp	**1.3**	**10.3**	**84.9**	**3.5**
Sulfate & soda	1.2	5.5	89.2	4.1
Semichemical	14.8	75.7	(165.1)	(5.4)
Mechanical	(0.2)	28.4	75.1	(3.3)

[illegible]
Source: API

for all grades of paper. Uncoated free sheet will account for 1.1 million tons of the new capacity, while coated papers—both groundwood and free sheet—will provide 457,000 additional tons. Almost no growth is forecast for the other printing and writing paper grades.

Kraft packaging paper. With the exception of some shutdown capacity, almost all of the 247,000-ton reduction forecast for unbleached kraft packaging paper—to 3.8 million tons in 1986 from 4.1 million tons in 1982—is attributed to planned shifts of machine production to kraft linerboard.

Tissue. The startup of three new machines during the 1984-86 period and modernization projects already completed will increase tissue capacity by 363,000 tons, or 2.3% annually, to 5.5 million tons by 1986, according to API.

Unbleached kraft linerboard. Unbleached kraft linerboard capacity will rise by 737,000 tons to 17 million tons by 1986, or 46% of total board capacity, the survey reports. This includes swings of machine production from kraft paper to liner, rebuilds, improvements to existing units, and one new kraft liner mill.

Recycled paperboard. API expects capacity for recycled paperboard to increase 254,000 tons during the forecast period, or just less than 1% a year, to 9.1 million tons.

Sulfate and soda pulp. The highest growth rate for the major woodpulps is forecast for bleached and semibleached sulfate pulps, which will rise by 1.9 million tons, or 2.9% annually, between 1984 and 1986. Both grades are used mostly in printing and writing papers and food packaging paper and board. Conversely, capacity for unbleached sulfate pulp—used to make containerboard and kraft packaging papers—will grow just 0.3%, or 240,000 tons annually.

Market pulp. All of the additional capacity for market pulp during the 1984-86 period will be in bleached sulfate pulp, the survey reports. API sees capacity rising by 741,000 tons, or 4.6% a year, between 1984 and 1986.

'83 outlays jump 15%, survey shows

The pulp and paper industry will be one of only a few U.S. businesses to have increased capital spending in 1983, according to McGraw-Hill Economics' recently released annual fall survey of U.S. capital spending plans. McGraw-Hill estimates the industry spent $6.86 billion in 1983, up 14.9% from the 1982 level of $5.97 billion. U.S. business as a whole spent 3.7% less in 1983 than in 1982, said the report.

U.S. pulp and paper companies plan to boost capital outlays to $7.44 billion in 1984, the survey shows, up 8.4% from the estimated 1983 level, while U.S. business in general plans a 9.4% increase. Though an 8.4% boost is not as dramatic as increases planned by some other industries—automakers head the list at 49.2%, for example—pulp and paper companies don't have to play catch-up, McGraw-Hill points out, since they were among the few who increased capital spending in 1983. Adjusted for an anticipated 5.2% hike this year in the price of capital goods, the paper industry's real spending will rise 3.2% vs 3.6% for business overall.

Pulp and paper industry spending plans for 1985 are even more ambitious: preliminary reports show companies planning a whopping 22.1% increase in capital expenditures to $9.80 billion, the third largest increase planned among U.S. industries. Business overall projects 1985 capital spending growth of 7.4%.

The paper industry for the most part mirrors business's rosy view of the economy in 1984, with 69% of those surveyed anticipating rapid growth, 19% normal growth, and only 12% seeing slow growth ahead. Paper companies anticipate raising prices 4.7% next year and expect sales to go up 10.8%—somewhat less than the 12% gain in sales seen by business overall.

The paper industry continues to devote a disproportionate amount of capital to energy conservation, with expected outlays of 5.0% in 1983 and 4.3% in 1984 about double business's average of 2.4%. In the area of automation, pulp and paper firms expect to raise spending by 10.9% in 1983 and 11.4% in 1984, lagging business as a whole, which plans to spend 14.7% of total outlays on automation in 1983 and 16.6% in 1984.

INTERNATIONAL TRADE

U.S. pushing Japan for concessions

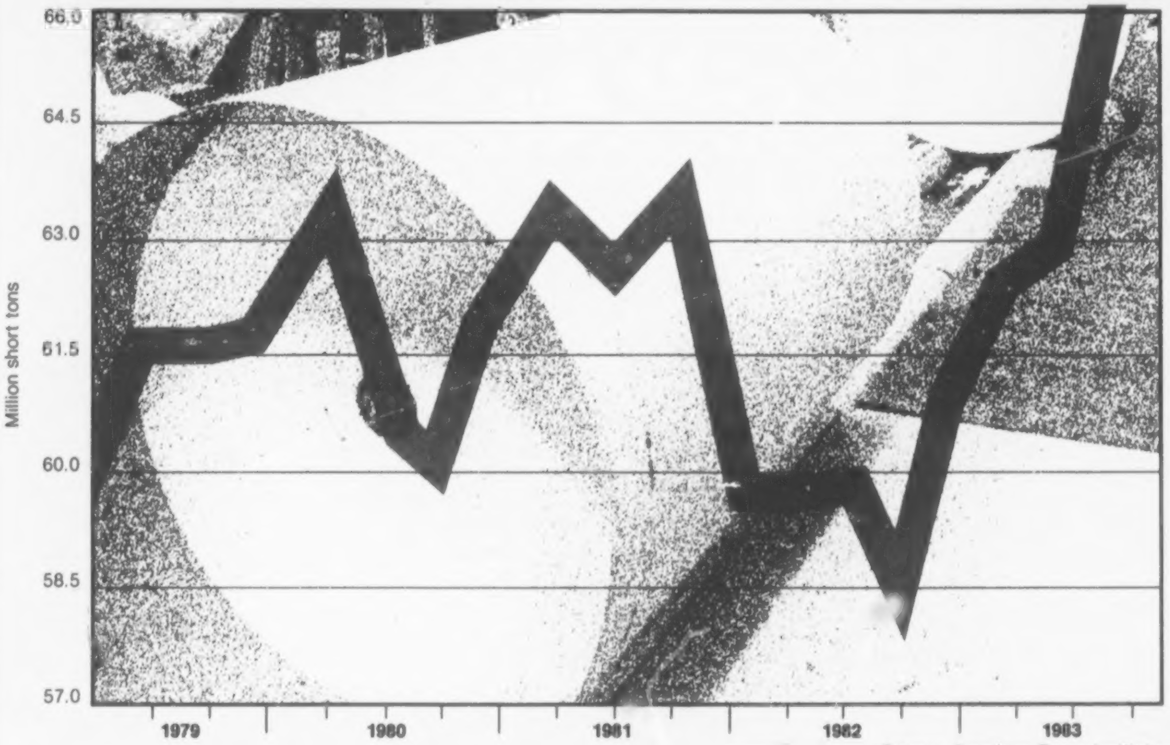
Restrictions on pulp and paper imports into Japan have been a bone of contention for U.S. industry, which seeks freer entry for its products into the Japanese market. Commerce Secretary Malcolm Baldrige discussed paper industry restrictions on his recent visit to Japan. And now, at the invitation of the Japan Paper Assn., 13 CEOs of U.S. paper companies will go to Japan early this year to meet and talk with their counterparts from Japanese paper firms.

Although Japanese officials contend there are no barriers blocking imports, they have taken some steps toward lowering tariffs on some paper imports.

A first step was made early in 1983 when tariff reductions on several paper items imported from the U.S. that were scheduled to become effective in 1987 were advanced to Apr. 1, 1983 (*P&P*, Feb., p. 13). Scheduled reductions for additional grades have now been advanced from 1987 to April 1984. These include sack kraft paper (excluded in the earlier round), which will now join kraft linerboard next April at the 9.3% tariff level. Twelve coated printing and coated specialty paper grades will also be granted a lower tariff in 1984—but since the total import of these grades into Japan last year was only 58 tons, this is not a very meaningful reduction.

The U.S. government has been pushing for lower tariffs on paper imported into Japan because the U.S. paper industry is one of the few U.S. industries that is in a position to export competitively worldwide, observes Dr. Irene Meister, vice president/international of the American Paper Institute. As an industry supporting liberal trade, it is the U.S. paper industry's position that Japan, the world's second-largest paper/board producer, should have a more open market. Meister points out that the U.S.'s market share of Japan's total paper consumption in 1982 was 1.7% and its share of paperboard 2.1%. For kraft linerboard, the U.S. supplies less than 5% of Japan's total linerboard consumption—dramatically less than the U.S. market share in Europe.

U.S. paper and paperboard production, 1979-83 *(seasonally adjusted annual rate by quarter)*



Source: American Paper Institute.

OUTLOOK 84

Strong U.S. pulp and paper industry recovery seen continuing in 1984

Rising output and a wider price-to-cost margin should produce banner profits—but some worry about high interest rates and the strong dollar

SPECIAL P&P REPORT

■ The strong recovery that began last year in the U.S. paper industry should continue into 1984, with rising prices combined with moderate cost increases, resulting in a banner year for profits, according to most industry observers.

But high interest rates related to the huge federal budget deficits—expected to run in the $150- to $200-billion range over the next several years—remain a source of concern. "The most critical problem for the paper industry is the ongoing conflict between fiscal and monetary policy as it affects interest rates, dollar exchange rates and inflation," notes Dr. Edwin Gee, chairman and CEO of International Paper Co.

Any significant runup in interest rates this year would add further strength to the dollar and further undermine competitiveness of U.S. pulp and paper producers in overseas markets. Higher rates would also stifle any further recovery on the forest products side of the industry and set the stage for another recession that could drag down the paper industry as early as next year. Nevertheless, most industry executives surveyed

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Outlook '83 was prepared by Carl Espe and Will Mies in San Francisco and Debra Adams and Dave Allan in New York.

What analysts are projecting for 1984

Percentage change from 1983 levels[1]

	Growth in real GNP	Paper/board production	Operating rates[1]		Prices paper/board	Costs per unit output	Operating profits[2]	
			Paper	Paperboard			Paper	Forest prod.
George Adler Smith Barney	+4.9%	+4.0%	94.8%	92.6%	+12.0%	+4.0 to +5.0%	+40.0%	+125.0%
Chad E. Brown Kidder Peabody	+5.1	+5.0	+94.5	93.2	+12.0	+4.0	+85.0	+25.0
Clarence W. Brown Lehman Brothers	+4.0	+4.0	93.0	93.0	+8.0	+5.0	+75.0	+50.0
Thomas P. Clephane Morgan Stanley	+5.1	+4.9	94.8	92.8	+10.5	+5.6	+95.0	+90.0
Evadne S. Lynn Merrill Lynch	+5.3	+4.6	91.8	90.0	+11.0	+4.3	+47.1	+68.5
Lawrence Ross Paine Webber	+5.1	+5.0 to +6.0	92.5	94.0	+7.0 to +8.0	+1.0 to +2.0	+50 to +60	+70 to +80
Mark S. Rogers Dean Witter	+5.0	+5.3	94.0	93.5	+15.7	+6.2[3]	+91.0	+129.0
H.C. Bowen Smith Salomon Brothers	+5.0 to +5.5	+4.0	93.0	93.0	+7.0 to +8.0	+4.0	+70 to +75	0 to +10
Rodney Young/John Maine Data Resources	+5.6	+5.6	93.0	95.0	+14.1	+4.3	n.a.	n.a.
William M. Wigder First Manhattan	+5.2	+6.6	97.0	94.0	+9.0 to +10.0	+6.0	+70.0	+35 to +40
Average	**+5.1**	**+5.0**	**93.8**	**93.1**	**+10.8**	**+4.5**	**+70.1**	**+67.2**

1. Operating rates show production as a percent of capacity.
2. After-tax profit excluding extraordinary or nonrecurring items. Earnings for paper companies generally include some contribution from wood products, while forest products profits derive partly from paper operations. Merrill Lynch and Salomon Brothers estimates are based on pretax profits.
3. Input costs.

by *Pulp & Paper* believe that "crowding out"—a serious collision between federal and private credit demands that would drive up rates—can be avoided this year, allowing time for a post-election budget compromise to be worked out in 1985.

FROM THE DEPTHS. U.S. paper industry production last year bounced back from the depths of the recession with remarkable strength. Production for 1983 is expected to hit a record 64.6 million tons, with paper at 32.8 million tons and paperboard at 31.8 million tons. "This would put paper 6% above the previous high established in 1981 and 8% above the 1982 recession level," American Paper Institute estimated. "Paperboard would be 2% above its 1981 high and 9% above 1982."

Printing/writing paper showed the earliest strength, with uncoated free-sheet shipments for the year expected to be up 10% and coated paper shipments 12% higher than in 1982. The strong turnaround reflected the proliferation of small computers and other electronic office equipment, rising advertising expenditures and catalog sales, and some customer inventory building, according to analysts. Even coated groundwood—predicted to be in oversupply into 1984-85 because of a glut of new capacity—was tight by year-end, with customers on allocation and producers already thinking about new machines.

Containerboard production also made a strong comeback, helped by record corrugated box shipments and a surprising 12% increase in linerboard exports. Liner output for the year jumped more than 10%, while semichemical medium increased about 7% and was in tight supply by year-end. Tissue production in 1983 rose about 8%, while bleached board increased 6% and recycled paperboard was up roughly 10%. Only newsprint and groundwood paper, up about 2% to 3%, failed to show strong volume gains.

"Sharply higher demand for virtually all grades of paper and paperboard has gradually led to stronger selling prices for many but not all of these products," according to Clarence W. Brown of Lehman Brothers Kuhn Loeb. By late 1983, prices for many white paper grades had returned to their prerecession 1981-82 peaks and containerboard had advanced close to its former list level after two rounds of price increases. But market pulp, newsprint, and sanitary tissue paper were notable exceptions to the improving price trend, Brown adds.

Because overcapacity was so great, the dramatic gains in production did not begin to pull operating rates of key grades up to the "magic 92% to 93% threshold," at which producers have historically been able to push through price increases, until the second or third quarter of last year, notes analyst Thomas P. Clephane, of Morgan Stanley & Co. For the year, the overall industry operating rate averaged only about 92% for paper and 89% for paperboard while overall industry prices were flat to slightly lower, according to the consensus of analysts surveyed by *P&P*.

(Continued)

The importance of price movement for the industry can be seen from the fact that despite an 8% production gain and relatively no rise in unit costs, paper industry operating profits in 1983 rose only about 5% to 10%, according to most analysts' estimates. And of course some of this probably came from a sharp resurgence in forest products earnings.

CROWDING OUT? The full-throttle momentum of the economy going into 1984 against a background of looming budget deficits appeared to give further credence to "Dr. Doom scenarios" of rising interest rates. "The plain and simple truth is that deficits of this size do crowd out the private sector in competition for financial resources," Potlatch chairman and CEO Richard B. Madden told analysts recently. "The potential impact of the present deficit on the forest products industry is already apparent."

Nevertheless, API senior vice president Norma Pace is optimistic that any rise in interest rates this year will be moderate. "We're expecting that interest rates will hold near current levels through spring of 1984 after which there may be a modest increase—but we do not expect interest rates to reach a level that will stop the economic recovery," she says. "We are optimistic inflation rates will not heat up too much this year, which would mean that lenders might ask for a smaller premium . . . and the Federal Reserve would be under less pressure to pull in the monetary reins."

And analyst Lawrence Ross of Paine Webber believes that private credit demands will be modest this year due to the "dramatic improvement in the amount and quality" of corporate cashflow. "For years corporate depreciation allowances have been too low because of rising inflation. Now with the decline in inflation, cashflow profits are looking better than reported profits." One reason has been changes in the tax law which permit more liberal depreciation allowances.

FURTHER GROWTH. Pace is projecting 4.7% growth in real GNP in 1984, following a 3.7% rise last year. "Paper production will continue to outpace real GNP and could be 6% in 1984 because of strong growth in communication and magazine paper." Industrial production should rise over 8% in 1984 and this would result in a 7.5% to 8% increase in linerboard production. Overall, she expects operating rates to average 94% for paper and 95% for paperboard in 1984.

Dr. Gee expects GNP to rise by 5% in 1984, while inflation increases only modestly from 3.5% in 1983 to around 5% in 1984. "Some of the underlying economic and political trends that make IP optimistic about the future are continued inventory building and an upswing in capital spending, along with modest gains in consumer spending and home building.

"Because the industry has historically tracked the overall economy closely, IP is forecasting an increase in paper and paperboard production of about 6% to 7% in 1983 and 4% to 5% in 1984. Operating rates should average above 90% in 1984, and assuming the recovery continues, remain there in 1985-86."

And Steven C. Mason, president and chief operating officer of Mead Corp. comments: "Moderating interest rates and the national election should provide the stimulus for continuing U.S. economic recovery in 1984 and this will benefit both paper and paperboard."

He expects paper production will grow 4% in 1984, less than its rise in 1983, "but still healthy." Some of the strong turnaround in paper demand in 1983 may have been due to inventory building, he notes. "As pipelines fill, there will be some reduction in demand for paper and a slowdown in the rate of paper price increases." Containerboard production should grow 4.2% this year, with a 4 percent improvement in capacity utilization, he says.

"Market demand for printing and writing paper looks like it will remain strong through 1984," said W. A. Franke, president and CEO of Southwest Forest Industries Inc. "The market outlook for linerboard also looks positive. Linerboard operating rates approaching 95% are anticipated by the end of 1984's second quarter. Overcapacity, particularly in the West, and persistent problems with a strong U.S. dollar against foreign currencies should depress newsprint operating rates, but there will be an increase in demand over 1983."

UNCERTAIN EXPORT MARKETS. Franke is fairly pessimistic about export markets this year. "Though the dollar is expected to decline somewhat in 1984 against major western European currencies and the Japanese yen, a drop large enough to substantially improve the U.S. competitive position during 1984 seems unlikely," he says. "In addition, strong domestic demand should offer producers better profit margins than those available in foreign markets. Long-term prospects for improved foreign economies and demand for pulp and paper products look encouraging, but significant increases in export activity are unlikely until 1985."

But Dr. Gee is somewhat more optimistic: "How much the dollar declines in 1984 will play a leading role in the rebound of U.S. exports. With the U.S. rapidly regaining its low-cost producer status, IP projects a modest growth in U.S. paper and board exports in 1984 of between 5% and 10%."

And analyst H. C. Bowen Smith of Salomon Brothers notes that since Scandinavian producers are operating at capacity, incremental demand from Europe will have to be satisfied either by the U.S. producers or from inventories. "That situation should allow for stronger export prices in 1984."

MAGIC THRESHOLD. Analysts surveyed by *P&P* expect operating rates for paper to average 93.8% in 1984 and for paperboard, 93.1%. "But in a number of the really important grades—linerboard, uncoated free sheet, coated papers, and bleached board—operating rates should be near 95% or above," Clephane says. Mark Rogers of Dean Witter Reynolds predicts operating rates of 98% for linerboard, 95% for coated paper and uncoated free sheet, and 94% for bleached board.

According to the latest API survey, paper and paperboard capacity will rise only 1.6% in 1984 and average 1.5%/year for the entire 1984-86 period. But Smith Barney analyst George Adler says that this year the industry may "find capacity" due to the shift of kraft paper machines to liner production, white paper machines dropping less profitable grades, and recently installed machines running above design capacity.

Analysts on average are looking for about a 10% to 11% rise in paper and paperboard prices in 1984. "We expect the largest pricing gains in linerboard, market pulp and uncoated printing paper, all of which experienced significant price declines during the recession," Rogers notes. Clephane projects linerboard prices will rise about 21% next year and uncoated free sheet around 12.5%.

HOLDING DOWN COSTS. U.S. paper industry costs per unit of output were relatively flat in 1983 and will probably rise only 4% to 5% this year, according to most analysts. Unit labor costs actually declined last year due to a dramatic 10% rise in productivity (output per workhour) which more than offset a 7% increase in wage rates.

"Fiber costs are currently showing mixed trends," according to Merrill Lynch analyst Evadna Lynn. Southern pulpwood and chip prices are rising moderately, while chip costs on the West Coast have dropped sharply due to higher lumber production and weak export demand. Energy costs have been relatively stable, while chemical costs have probably declined, she says.

In 1984 Lynn looks for the following increases in unit costs: labor, 2%; fiber, 3%; energy, 5%; chemicals, 11%; and freight, 5%. "Certain companies will also benefit from the substantial reduction in overhead costs which were prompted by the severe financial pressures during 1982 and the first part of 1983," Smith notes.

Peter J. McLaughlin, chairman and CEO of Union Camp Corp., recently told analysts that his company—one of the most efficient in the industry—looks for an overall rise of 4% to 5% in input costs this year. "Output costs will certainly be lower than that because we are anticipating greater volume and more efficiency on the cost side due to further improvement in productivity."

BANNER PROFITS. Analysts on average expect the mixture of higher volume and prices plus moderation in costs to result in around a 70% increase in operating profits for U.S. paper companies this year—for what would be the sharpest increase in postwar years.

Forest products companies will show about a 67% increase in operating profits in 1984, despite a decline in housing starts from around 1.7 million units in 1983 to 1.67 million in 1984, according to the consensus estimate. The higher profits would reflect improved demand from remodeling, multifamily and export markets and higher income from pulp and paper operations.

The most bearish is Smith of Salomon Brothers who looks for housing starts of 1.5 to 1.6 million in 1984. "We believe that mortgage rates will stay in the 12.5% to 13.5% range, making it difficult for many people to buy single-family homes." He looks for no increase in lumber and plywood prices this year and a decline in manufacturing profits.

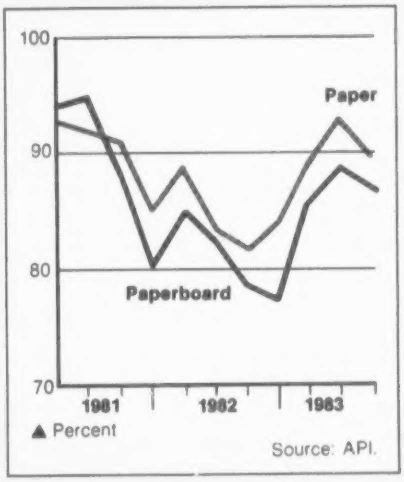
HIGHER CAPITAL SPENDING? Industry executives and analysts were mixed on whether increased profits will translate into higher capital spending in 1984. "Because of the recession, we project a 10% decline in industry capital spending in 1984," remarks Dr. Gee. "IP, as well as other companies, will continue to invest in those projects that lower manufacturing costs. Until prices in many segments of the industry surpass pre recession levels, there is insufficient return on investment for new capacity expansion."

A similar note of caution was struck by Franke, who said that said that Southwest Forest would continue to institute "tight operating controls and close fiscal management" in 1984. "Capital expenditures will be oriented toward ongoing improvements to existing plants and facilities to maximize efficiency and production."

"Capital spending should pick up for most of the industry in 1984," according to Mason of Mead. "Return on investment at current prices will not justify those expansions, but you have to bet on the future in this business and the bets are big!"

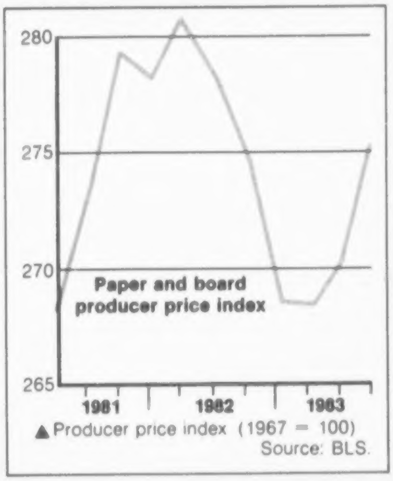
(Continued) ■

U.S. paper/board operating rates firmed in 1983 . . .



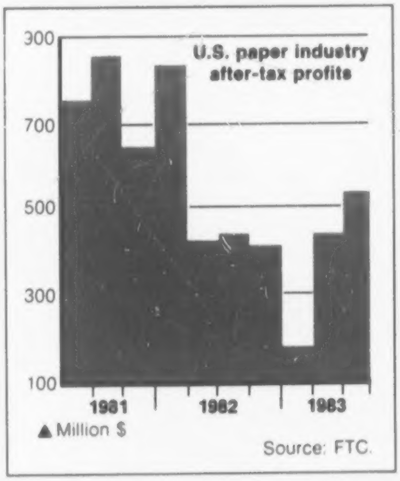
Source: API.

. . . enabling producers to push through price hikes . . .



Source: BLS.

. . . which helped restore hard-pressed profit margins



Source: FTC.

COATED PAPER

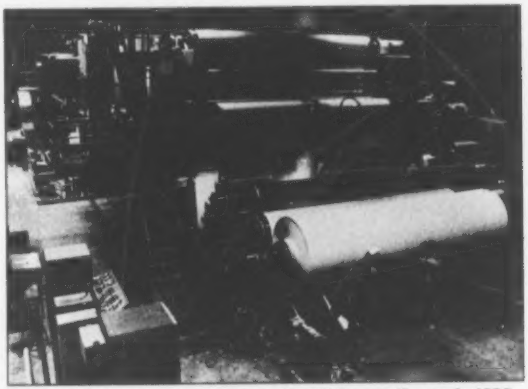
Roaring recovery is under way

Coated papers entered 1984 with virtually all machines operating full tilt and customers on allocation for most products. This situation will continue through much of the year and could last into 1985 and beyond, industry executives say.

Indeed, with no major coated paper capacity expansions currently announced—although several projects are possible candidates for startup in the next five years—the only thing that could hurt the market would be a significant economic downturn.

Both coated groundwood and coated free sheet benefited from the dramatic turnaround in demand during the second half of 1983. The two paper grades differ in significant ways, however, so they will be handled separately here.

COATED GROUNDWOOD. Looseness in supply had shown up in 1982, but it was not until early 1983 that the situation got bad enough that prices deteriorated significantly. In early June an attempted price increase fell apart for lack of support—but by mid-July customers reported trouble securing adequate supplies of paper. The turnaround was sudden indeed.



The market for coated paper should boom through 1985.

Following successful price hikes of about 7% in October 1983—bringing price levels back up to where they were at the start of the year—further increases of 7% to 8% were announced for January 1984. Allocations were in effect, and disappointed customers were going to uncoated groundwood or were shopping around for papers from West Germany, France, Finland or Italy.

Executives contacted by *P&P* expect allocations to remain in place through 1984 or beyond. St. Regis Corp. senior vice president James Bowersock believes allocations could last through 1987 "and possibly longer," while Blandin Paper Co. vice president Thomas McKeon expects them to continue until new capacity starts up or the economy slows down.

Both Bowersock and Michael P. Corey, Champion International Corp.'s director of planning and analysis, expect customers to go abroad for coated paper "if there is a modest shortfall in supply," in Corey's words. Bowersock predicted allocations will "very likely result in a significant increase in imports as it did in 1978 and 1979. The primary source of these imports would be Finland."

He also expects customers to shop around for uncoated supercalendered paper if they can't get all the coated groundwood they want. He notes that "since uncoated groundwood grades have prominent positions in magazine publishing (6%), other periodical (59%) and commercial printing (5%), these are all possible markets for potential penetration" by uncoated groundwood substituting for coated paper.

Bowersock also noted that "uncoated groundwood has lost its greatest share in the 'other periodical' market, and this would appear to be the area in which SC groundwood would have the better opportunities."

One other U.S. coated groundwood executive, who forecasts a 96% operating rate for his industry in 1984 compared with his estimate of 94.5% in 1983, picked commercial printing, catalogs and Sunday magazines as the likely areas for uncoated groundwood penetration into coated.

He and virtually all other observers think the industry will have to run at nearly full capacity this year just to satisfy demand. Blandin's McKeon sees operating rates at about 95%, which he described as "the full rate," while Bowersock sees rates rising from 93.7% in 1983 to 98.3% this year. Last year's 14% increase in shipments, from a poor base, will be followed by a healthy 7% rise this year, according to the St. Regis executive.

McKeon pointed out that a 13.3% increase in coated groundwood shipments through the first eight months of 1983 represented a rise in demand of more than 225,000 short tons from the same period in 1982, thus absorbing virtually all of the new capacity started up in the previous two years.

Another U.S. executive sees magazine shipments lagging industry averages in 1984 with only a 4% rise, but says catalogs and commercial printing demand should climb about 6% to produce an average increase of 6% for the coated groundwood industry.

With this kind of strength in demand and shipments, customers will be hoping for announcements of new capacity. Unfortunately not much new capacity is coming online in the next few years.

Champion forecasts capacity increases of just 15,000 tpy each from relatively new paper machines started up in recent years by Mead, St. Regis and Weyerhaeuser Co. as those units reach peak design capacity. Champion also sees 15,000 tpy of new capacity at Pentair in 1984 in addition to 6,000 tpy of new Pentair capacity in 1985, plus miscellaneous additions through modernization work throughout the industry totaling a further 55,000 tpy in 1985 and 22,000 tpy in 1986.

Some customers consuming top-end coated groundwood may contemplate shifting up to Scott Paper Co.'s new Hinckley, Maine., machine, which started up in late 1982 and is still getting up to speed, but Champion only sees 55,000 tpy of additions from that machine in 1984 and 20,000 tpy in 1985. But Bowersock points out that the 200,000-tpy Scott unit is dedicated to basis weights of 40 lb and up and thus won't compete with lightweight coated producers such as St. Regis.

Most observers do expect to see some new coated groundwood machines announced this year. One U.S. executive predicts new announcements will signal the addition of 180,000 tpy of capacity, while Bowersock notes "it is very likely that at least two machines will be announced for starting in 1987 or 1988." Blandin's McKeon predicts "at least two other machines" will be announced in the next six months, other than a new unit Blandin has been considering for some time.

COATED FREE SHEET. Allocations were also in place for coated free-sheet customers at the beginning of the year, and observers say that situation is likely to continue through much or all of 1984. As Champion's Corey notes, "the only downtime currently taking place is due to maintenance and/or repair needs. Basically, the coated free-sheet business [was] operating at full capacity in 1983 and will continue to do so in 1984."

St. Regis's Bowersock estimates coated free-sheet operating rates for 1983 at 93.7%, the same as coated groundwood, but he believes free-sheet mills will run at 94.8% in 1984—a slightly less superheated pace than the 98.3% of groundwood but still very respectable.

By the same token, free-sheet mills also did not see quite the slide in early 1983 that groundwood mills experienced. The 8% jump Bowersock saw in free-sheet shipments in 1983 was healthy but well short of groundwood's levels. Still, the more stable free-sheet industry will increase its shipments by almost as much as groundwood in 1984: up 6% compared with the 7% climb Bowersock sees for groundwood.

One U.S. coated paper mill executive sees a free-sheet shipments rise of just 4% this year, but even this would keep operating rates high in face of the 3.5% increase in annual coated free-sheet capacity forecasted by American Paper Institute for 1984.

And at Champion, Corey believes that "all coated paper shipments will outpace the GNP" in 1984, and that coated free-sheet consumers are not likely—in face of tight coated groundwood supplies and also high-quality demands made by advertisers—to attempt to downgrade to other kinds of paper.

The one new machine in coated free sheet in recent years is the 200,000-tpy unit that Scott started up in Maine in late 1982. But as Corey notes, "a fair amount" of the output of that machine is aimed at the book publishing industry. "Publishers' matte would be a large part of what the machine is now producing," although "most likely they will continue to try to develop other products on the machine." He believes the machine will eventually affect both the free-sheet and groundwood markets, but notes "both markets are getting stimulus from an increase in demand from a broad range of areas, so the effect might not be too significant."

Other than that machine, no significant blocks of capacity are likely to come online in the next two years, so operating rates should continue high. Indeed, Champion sees the Scott machine bringing in 120,000 tpy of capacity in 1983, 55,000 tpy in 1984 and 20,000 tpy the following year. The company forecasts other miscellaneous industry improvements over the four-year period of 1983-86 averaging just 28,000 tpy annually plus "other probable additions" starting in 1986 when this category would add a further 40,000 tpy to industry capacity. Thus new capacity will continue to lag new demand.

One area of coated free sheet that appears unlikely to rack up any large gains is the coated one-side business, where Bowersock thinks 1983 shipment gains will be followed by a rise of just 1% this year.

UNCOATED FREE SHEET

Little downtime likely in '84

Uncoated free-sheet mills won't have much reason for concern about operating rates this year as the industry appears to be heading into its best year by far this decade. Most major end uses have recovered strongly from the recession and appear headed for healthy growth for several years to come.

Some uncoated free-sheet products were on allocation or in tight supply going into 1984, although part of that was due to bounce-back from artificially depressed sales levels plus normal recovery-year inventory-building that will moderate in the coming months.

However, International Paper Co.'s Michael Pollert noted in a recent interview in a printing industry publication that "the printer's challenge for the short-term will be to manage his paper inventories so as not to lose out on business" since "we have orders to fill our manufacturing system right now, and lead times are getting longer."

That situation should correct itself somewhat this year. Champion International Corp.'s Michael Corey predicts that "once a more reasonable balance between demand and supply has been struck, the uncoated free-sheet market will grow at a more traditional pace—that is, slightly ahead of the GNP." Union Camp Corp.'s Robert Sasser says that "we feel inventory levels have about peaked."

Corey believes that bond and copier papers will outperform the GNP and offset will keep pace with overall economic activity, but envelope and tablet papers will lag economic growth rates.

The spread between uncoated free sheet's high-flyers and its slow-lane performers was wide last year, and that divergence will moderate some in 1984. Union Camp's Sasser projects cut-size bond and xerographic paper shipments will grow at 6% to 7% in 1984, compared with a 17% to 18% explosion in 1983. Offset printing paper's 6% rise last year will moderate to 3% this year; forms bond's 9% to 10% jump in 1983 should now slow down to a still-respectable 6% to 7% climb.

What this will mean for all uncoated free sheet, in Sasser's view, is an average growth rate that is down from 8% last year to about 3% or 4%. Even the slowest of the major slow-lane performers, the book publishing industry, should see its uncoated free-sheet shipments rise 1% to 2% this year, Sasser predicts.

Although Sasser says "the book market is recently showing signs of recovery," Corey disagrees. "There is no reason to expect the book market to recover during the next year," he says. Book manufacturers are tied to the performance of both domestic and foreign markets and are also likely to be slowed down by declines in school enrollments, according to the Champion International executive.

"Granted, there are other aspects to the book market—such as fiction and non-fiction. But the elementary /high school/university segment is such a significant part of total sales that we'd have to look at that as our indicator," he concludes.

One factor affecting the printing grades of uncoated free sheet was pointed out in the recent interview with International Paper's Pollert. He noted that "copy paper and computer forms paper is made on the same . . . machines that offset and other printing grades are made on. So commercial printers are, in effect, competing with machine time with two faster-growing segments."

He expects commercial printing growth rates to roughly match the GNP in the next few years, while uncoated free sheet as a whole—and particular copy papers, forms and web offset—are leading the parade.

Pollert thinks this kind of growth will lead to overall uncoated free-sheet operating rates of 94% to 95% this year. Union Camp's Sasser is a bit more bearish, predicting no change on average from the 92% to 93% of 1983. On the other hand, he sees no lasting harm from the 1.1 million tons of new capacity American Paper Institute sees coming online between 1983 and 1986 (an 11.9% rise over those four years). In Sasser's opinion, "the rise in demand over the next two years should just about cover capacity increases."

Corey feels that "a modest imbalance between demand and capacity is bound to occur until the overall average of usage catches up with instantaneous addition of capacity." But Corey also sees some signs on the horizon that end-use markets will take care of that new capacity over the long run. He agrees with Sasser that personal and small office copiers will have a positive impact on paper demand, especially over the next five years.

Indeed, Sasser thinks that without "continued placement of smaller, cheaper, more convenient copiers, copy volumes could mature to 5% to 6% growth per year." With such a trend toward cheaper and smaller copiers, however, annual copy volume growth rates of 8% to 10% are reasonable over the next five years.

Not all of the product trends are favorable to the uncoated free-sheet industry, however. Corey notes that "more groundwood forms paper will begin to be sold." He explains that in recent years "groundwood gained share because it provided an economical alternative for some applications over a period of time. It then lost share when the difference in price between groundwood and free sheet narrowed to the point where users had no incentive to continue to accept a loss in production and desirability aspects of the end product."

In Corey's view, "the relationship between these two products is based primarily on price." Sasser agrees that "groundwood forms growth depends on the price differential between uncoated free and groundwood." Neither one will comment on the likely price differential between the two products, but clearly as prerecession differentials are restored—which many other market observers claim is happening—it is bound to restore some of the attractiveness of groundwood forms.

CONTAINERBOARD

Strong rebound seen

Tighter markets for linerboard and corrugating medium are forecast by most industry observers for 1984, with continued growth in demand and only limited capacity expansion. This should enable producers to push through substantial price increases to restore badly needed profitability.

BOX BOUNCEBACK. Shipments of corrugated boxes came back strongly with the economy in 1983, rising about 7.5% from their depressed 1982 level and exceeding their previous all-time high of 250.6 billion ft^2 set in 1979. The resurgence should continue in 1984 with most economic forecasters predicting about 9% growth in industrial production, which box shipments closely track.

Roger W. Stone, chairman and CEO of Stone Container Corp., predicts corrugated box shipments will rise 6% to 7% this year, followed by growth of 5.5% in 1985 and "maybe" 3.5% to 4.0% in 1986. J. Carter Fox, president, Chesapeake Corp. of Virginia, says the domestic corrugated box business should "reflect the general improvement expected in the overall economy," adding that "the structural shift within the economy toward the service sector should give the corrugated box business additional momentum."

Liner output sprang back more than 10% over its depressed 1982 level last year, helped by a surprising 12% rise in export shipments despite the strong U.S. dollar and lagging recovery in most other parts of the world. "We expect growth in demand for U.S. kraft linerboard to be in the 4% to 6% range which, combined with continuing improvement in the export markets, will raise operating rates in 1984 over 1983," forecasts Fox.

Stone expects liner operating rates to rise from about 91% in 1983 and their depressed 84% level in 1982 to 98% in 1984 and more than 100% in 1985. "I'm not sure what the 1985 number means, except that customers will really be scratching for brown fiber," Stone says. A Weyerhaeuser Co. executive notes: "Overall, we expect 1984-86 to be strong years for containerboard, with higher operating rates than we have seen historically."

PRICE RELIEF. Improving operating rates and the desperate need to restore profitability resulted in two \$20/ton eastern U.S. price increases on 42-lb liner last year to \$270 in April and \$290 in September—but even at that level the typical U.S. mill was probably only at about the breakeven level (especially with some discounting below list prices). Therefore, producers are trying to push through another increase to \$320 on liner (\$310 on semichemical medium) in early 1984.

"Without specifically commenting on prices, it seems clear that with very good operating rates expected in 1984 and a poor financial performance by our industry for the past two years, there should be strong pressure to regain satisfactory margins," Fox notes. Analyst Thomas P. Clephane of Morgan Stanley & Co. expects list prices to average \$326 for all of 1984, up from \$270 in 1983, and then average around \$388 in 1985. This would result in dramatic increases of 21% in 1984 and 19% in 1985.

CAPACITY SHIFTS? Improving profitability will no doubt encourage a new round of containerboard capacity expansion. But as Goldman Sachs analyst Bruce Kirk notes, "New mill or machine lead time is two or three years, and it is doubtful that any sizable new unit could be brought online before late 1985." Latest API capacity survey shows unbleached kraft board capacity rising by only 1.4%/year over the 1984-86 period. This includes a new 280,000-tpy mill for which financing was still uncertain in late 1983 but excludes a new machine announced by Chesapeake Corp. which will add 83,000 tpy (net) in 1986.

One source of uncertainty, however, is how much kraft paper capacity may be converted to linerboard production if plastics make strong inroads into the grocery sack market. "About 5% of paper grocery sacks have been displaced by plastic sacks, primarily in metropolitan markets," Kirk says. "Various studies indicate that as much as 25% of the 2.1-million-ton grocery sack market may eventually be dislodged, and dedication of 500,000 to 600,000 tons of grocery sack paper to linerboard would increase capacity." But Kirk notes that some kraft paper machines may be shut down because their conversion to liner may be uneconomical, while others may be shifted to bleached grades (International Paper at Mobile, Ala., and Haindl Papier at Port Townsend, Wash.).

Another area of uncertainty is export markets where U.S. producers may continue to be handicapped by the strong dollar. Nevertheless, Fox comments that "underlying demand for U.S. linerboard in overseas markets will show improvement in 1984."

BOXBOARD

Prices on firming trend

Folding carton plants were still not running as well as expected late in 1983, causing continued weakness for recycled boxboard and solid bleached sulfate mills, observers said.

Price increases slated for clay-coated recycled board and bleached board in the fourth quarter of 1983 were firming late in the year, but some observers felt it could take until the second quarter of this year for the new levels to take effect for all customers.

SBS prices were scheduled to go up $35/ton to the 1981 list price of $625 by Oct. 1, but some producers reportedly rolled back to Nov. 1, and at least one manufacturer was planning to implement the increase on Dec. 1.

Clay-coated recycled board producers were attempting late in the year to return to the 1981 list of $425/ton (20-pt, 80-brightness, in rolls), with increases averaging $20 to $25, but the move was meeting strong resistance due to high inventories and relatively poor demand for folding cartons.

WASTEPAPER COSTS SOAR. Despite slow orders for the normally busy Christmas season, recycled board producers struggled to raise prices to offset sharp increases in wastepaper costs during the second quarter. As early as August, clay-coated mills sought a price hike, but many customers were still not at the new level by late in the year.

However, an early summer $20/ton price increase to $280/$300 for 20-pt bending chipboard in rolls took hold with relatively little resistance. Market observers attributed the strong market to a limited supply caused by machines permanently shut down over the past few years and the diversion of some tonnage to construction grades.

Forecast of U.S. paper/paperboard operating rates

	1982	1983e	1984e
Newsprint	89.2%	89.8%	91.9%
Uncoated groundwood	83.8	84.5	89.8
Coated paper	90.1	91.4	94.8
Uncoated free sheet	87.8	94.9	94.9
Packaging & industrial	87.7	91.9	94.7
Tissue	85.8	89.[illegible]	92.0
Total paper	**87.7**	**91.4**	**92.9**
Unbleached kraft	83.9	90.9	95.4
Semichemical	83.2	89.1	90.2
Bleached board	87.6	91.8	95.3
Recycled board	74.2	79.5	83.1
Total paperboard	**81.8**	**87.9**	**91.5**

Source: Average of Merrill Lynch and Dean Witter Reynolds estimates (based on capacity data from 1982 API survey).

Operating rates for chipboard mills are expected to be in the mid-90s, according to market executives. Clay-coated producers will probably only run in the low 90s though, they indicate.

SBS mills are likely to operate in the high 90s, with continued growth in such end uses as aseptic packaging, ovenable paperboard, display board for advertising, and high-quality folding cartons used to package such products as cosmetics and drugs.

One observer feels SBS markets in heavy cup will rise 5% this year; plate, dish, and tray, up 2% to 3%; bleached bristols, up 3%; miscellaneous uses, up 4% to 5%; domestic milk carton, flat to down 2%; and folding carton, up 4% to 5%.

CHANGING MARKET SHARES. Some feel, however, that clay-coated board will continue to erode bleached board's folding carton market as recyclers continue to improve product quality. Others reply that clay-coated quality has reached its apex and demand will increase only in proportion to a rise in the overall economy.

Bleached board mill operating rates should remain high for at least the next few years due to limited capacity additions. Only 132,000 tpy of solid bleached paperboard capacity is expected to be added between 1982 and 1986, according to API's latest capacity survey. However, this does not include a new machine that one company may soon announce for a southern mill. Recycled board capacity, however, is expected to rise 409,000 tons over the same period, although most of the increase is in recycled containerboard and not boxboard.

Despite some weakness in the folding carton market late in 1983, though, this year is expected to see both recycled and bleached board markets recover to near-normal health.

Prices for both grades should rise again this year, with about a 5% increase in bleached board and an average 6% boost in the recycled grades, with chipboard probably moving higher than clay-coated. Depending on how fast the economy recovers, the price increases could take effect as early as the second quarter, a time when converters are ordering for the spring pickup in the market, observers say. ■

CANADIAN INDUSTRY

Light at end of tunnel may be real for Canadian mills in '84 after all

■ Canada's pulp and paper industry couldn't have had much more bad luck than it has seen in the last two years. The good news for beleaguered companies is conditions indeed won't worsen. The bad news is they won't get a lot better before the latter part of the year.

Newsprint mills are typical of the country's dilemma. Lagging behind in the race to maintain modern capacity in competitive locations during the 1970s—and troubled by endemic unemployment in some locales—the country responded with a government-sponsored binge of capacity expansion. What it got for its money in the early 1980s was a largely modernized industry in a recession-reduced marketplace.

Then in 1982 and 1983, when it became clear that more money thrown at more capacity would only produce more unmanageable debt, the pulp and paper industry shifted its gears and began emphasizing efficiency and quality-improvement.

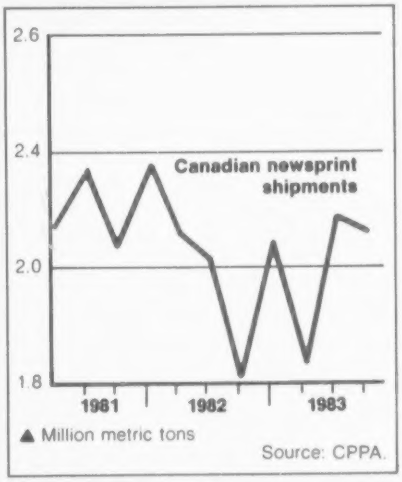
A Canadian newsprint mill—one of Kruger Inc.'s—had become the standard for the influential *USA Today* and its quality four-color graphics. The industry seemed on the right course. Then, in mid-1983, when the commercial printing industry and its insert and catalog customers—representing the most dynamic end-use group of the entire newsprint/printing/writing paper industry—began to take off, it was coated paper that became a twinkle in the printer's eye, not newsprint.

Fortunately for the Canadian industry, uncoated groundwood—including newsprint machines underutilized producing newsprint—were ready and available to supply paper for those customers who couldn't get all the coated paper they wanted. It now seems likely that the same commercial printing binge, if it continues into 1984, will help pull newsprint demand up by year's end. But it will still take a massive increase in U.S. daily newspaper demand—plus a reversal in the slumping fortunes of Canada's overseas newsprint customers—to soak up all that shiny new capacity added in North America over the last few years.

Market pulp mills were not in much better shape, although prices were on the mend during much of 1983 and seemed likely to recover—in fits and starts—through 1984 as well. As with newsprint, market pulp suffered from an excess of capacity around the world. And more than newsprint, Canada's market pulp industry was still hurting from the double-digit currency devaluations of 1982, which suddenly made Scandinavian producers the most competitive in the world.

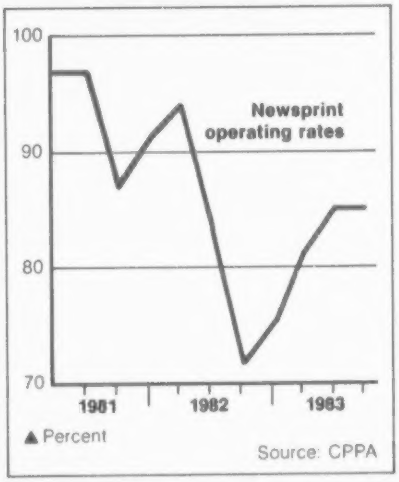
Canada's currency won't give much help there, and it may hurt the industry a little on the North American front during 1984. Much of the profit margin of recent years—when there has been a profit margin—depended on a weak Canadian dollar, bouncing around in the US$0.80 to US$0.82 area in 1983 compared with rough parity a few years earlier. Most in the Canadian industry expect their dollar to remain on roughly the same level with the U.S. currency during 1984, although British Columbia Forest Products Ltd.'s H.L. Martin did indicate

Recovery lifts Canadian newsprint shipments . . .



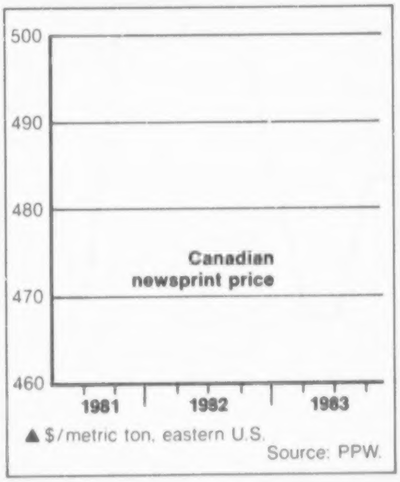
Source: CPPA.

. . . but excess capacity depresses operating rates . . .



Source: CPPA

. . . and keeps pressure on price levels in U.S.



Source: PPW.

the Canadian dollar could rise to as high as $0.85 or $0.86, reducing that comforting currency cushion.

If Canada's dollar is strengthening, it will be partly because the country is expected by late 1984 to have regained all the ground lost during the recent recession. Canada's real gross domestic product tumbled by 4.6% in 1982, and the Conference Board of Canada thinks it will take a 2.1% jump in 1983 and a 3.1% rise this year, back up to where it was in the fourth period of 1981.

And despite the slowly accumulating signs of recovery, the nation's horizon remains cloudy, with the 12.0% average unemployment rate of 1983 abating only slightly to a still-high 10.9% figure for 1984.

One sector of the Canadian pulp and paper industry whose performance directly tracks economic activity is tissue, and producers expect a fairly decent increase in demand in 1984. But with Scott Paper Co. starting up a 40,000-metric-tpy machine in New Westminster, B.C., industry operating rates won't be very impressive.

Facelle Co. Ltd. president Brian M. Blakely points out that Kimberly-Clark Corp.'s closing of its Kapuskasing, Ont., mill in 1983 removed 20,000 tpy of capacity. Even with that, however, he believes the Canadian industry's operating rate will fall from 88% in 1983 to 84% in 1984.

This is despite an expected 3% growth rate in the Canadian tissue market in 1984, same as in 1983, led by a 5% to 8% growth rate both years in the "bouyant" towel sector. But Blakely believes napkins will lag, at about 2% each year, while facial and bathroom tissue come in at the average level. Helping Canadian mills will be an expected advance of 5% to 6% in commercial/industrial tissue shipments, coming after an 8% jump in 1983. But Blakely points out this followed a "bad year" in 1982.

NEWSPRINT

Long, slow climb back uphill

Near-depression conditions in the Canadian newsprint industry and actual desperation in the British Columbia segment of the industry will begin to moderate in 1984 as the industry positions itself for a healthy performance in 1985 or beyond. Operating rates are expected to remain low in 1984 by historical standards, however, and few real rays of sunshine have appeared on the immediate horizon. Most of the industry will continue to struggle with downtime, uncertain overseas markets and an industry-wide reluctance to shut down or upgrade the presently excessive levels of capacity.

Most observers expect U.S. consumption to rise by about 4.3%, somewhat better than the 3.5% growth rate Abitibi-Price Inc. marketing vice president William Hall sees for 1983 once final figures are in for that year.

This would bring U.S. demand up to about 10.9 million metric tons in 1984, although St. Regis Corp. senior vice president James Bowersock is somewhat more optimistic, seeing a 5.5% demand rise to about 11.1 million tons. British Columbia Forest Products Ltd.'s H.L. Martin projects demand of just 10.8 million tons, however.

Several observers see Canada's market share in the U.S. rising slightly in 1984, reversing a trend of several years' standing. CIP Inc.'s W.P. Woodworth feels Canadian shipments to the U.S. will rise about 5%—slightly ahead of his view of the increase in consumption—to 6.2 million tons. Pemberton Houston Willoughby's Jaak Puusepp predicts that Canada's share of the U.S. market will edge up from a low of 56% in 1982 to 57% in 1983 and 57% to 57.5% in 1984.

OPERATING RATES. But that doesn't mean Canadian operating rates will return to healthy levels. Puusepp sees rates in the U.S. climbing from just under 89% in 1983 to a little more than 90% in 1984, while Canadian rates climbfrom 84% to 87%. BCFP's Martin is more pessimistic, forecasting rates of 81% in Canada for 1983 and just 85% in 1984. Western Canada is obviously in worse shape than the rest of the continent, and Puusepp forecasts an operating rate of just 79% in 1984 for that part of the country, compared with 71% in 1983; Martin's forecasts are one point lower still.

Most agree that the U.S. industry will continue to outperform its Canadian competitors. Abitibi's Hall believes U.S. mills were running at around 90% at the end of 1983 and will operate at 92% to 93% in 1984. St. Regis's Bowersock feels U.S. mills will run at 93.5% this year after averaging 88% in 1983.

One sign of poor operating conditions has been an excess of newsprint inventories at mills. Puusepp believes North American mill stocks, having risen 73,000 metric tons in 1983, will fall by 90,000 tons in 1984.

Consumer inventories are always much more volatile, and observers seem to disagree about what is going to happen there. One executive with a southern U.S. newsprint manufacturer predicts consumer inventories will rise 10% in the first half of 1984 and drop by the same amount in the fourth quarter after ending 1983 unchanged from 1982. Crown Forest predicts a 150,000-metric-ton drop in consumer inventories in 1983 followed by a 50,000-ton increase in 1984. Woodworth forecasts no change in 1984 after a 100,000-ton drop in 1983, while Puusepp agrees with Woodworth's 1983 number but sees stocks dropping another 65,000 tons in 1984. And BCFP's Martin expects consumer stocks to rise 50,000 tons after a 150,000-ton loss in 1983.

One question in terms of Canadian suppliers' ability to operate consistently through the year is the pattern of region-wide as opposed to local labor negotiations. British Columbia talks dragged on through late 1983, and the industry in eastern Canada faces negotiations in the spring of 1984. But most executives believe organized labor recognizes the condition of the Canadian industry and won't try to take mills to the mat this time.

IMPORTS FROM OVERSEAS. Several executives admit that threatened mill shutdowns caused by labor disruption could cause worried publishers to buy from foreign suppliers. And for various reasons, publishers have been doing just that.

Most executives agree on that fact, but there the concensus ends. Puusepp places U.S. imports from overseas at 48,000 tons in 1983 and 20,000 tons in 1984. St. Regis's Bowersock has a similar estimate of 54,000 tons and 18,000 tons. Martin picks a much higher number: 100,000 tons in 1983 followed by 120,000 tons in 1984. Abitibi's Hall estimates overseas imports to the U.S. at 80,000 tons for 1983; Crown Forest agrees with that and

North American newsprint operating rates

	1983	1984
United States	88.6%	90.2%
Canada	83.7	87.4
Eastern Canada	86.5	89.2
Western Canada	71.2	79.0

Source: Jaak Puusepp, Pemberton Houston Willoughby Inc.

goes on to forecast 1984 levels of 100,000 tons. Woodworth goes along with that estimate for 1984 but uses a lower figure—50,000 tons—for 1983.

One thing none of these observers disagrees on is the source of the troubling import tonnage: Scandinavia. The only difference seems to be over where the imported newsprint will go. Puusepp and one or two others see it ending up on the West Coast, while Woodworth notes that "import penetration has already reached [the] East Coast—Boston [and] Philadelphia" and Hall and Martin both foresee some penetration of the East Coast as well.

In the past, Canadian mills have often been able to shift unneeded tonnage from the U.S. to overseas customers in weak markets, but with overcapacity a global problem in 1983 and with all major markets depressed that clearly did not happen this time. Abitibi's Hall was forecasting a 5% drop in 1983 from the 1.525 million metric tons Canada shipped offshore in 1982. Crown Forest agrees with that estimate and projects just a 1.7% jump in 1984 offshore shipments. CIP's Woodworth sees a lower number for 1983 and 1984, projecting 1.35 million tons last year and 1.4 million for this year.

EEC IMPORT QUOTA. One important question in determining offshore shipments, obviously, is whether the January 1984 entry of the Scandinavian nations into the European Economic Community has any effect on Canada's duty-free quota for shipping newsprint to the EEC. One southern U.S. producer estimates it would reduce Canadian shipments by 100,000 tons, while Woodworth points out that such quota changes generally take time to implement and that there would be "probably no immediate effect in 1984."

Crown Forest notes any quota change would have little effect if the quota does not fall below 750,000 tpy (the quota for all non-EEC producers, including the Scandinavians, is currently 1.5 million tpy, and 750,000 tpy would approximately represent current Canadian shipment levels to the EEC). Hall and Puusepp simply agreed that, in Puusepp's words, "there will be a successful outcome to these negotiations." Puusepp also notes that "the EEC is not a growth area."

Some Canadian mills have responded to poor demand from overseas and from their traditional U.S. customers by invading new market areas in the U.S. Crown Forest comments that "in the first half of 1983, eastern Canadian mills shipped into the western U.S.A.—traditionally dominated by western Canadian producers."

Crown Forest and others note that by the second half of 1983, western Canadian tonnage was also showing up in areas normally dominated by eastern mills, although as BCFP's Martin points out, the tonnage shipped into eastern territories "appears minor compared to [the] flow of eastern Canadian and Scandinavian tonnage into western markets."

The reason for this movement of western paper into eastern areas seems obvious. Most observers cite the $55/metric-ton price advantage held by western newsprint over the eastern product as the major reason. The consensus is that this price differential will diminish and, with it, the western move into eastern provinces.

Many observers believe a slow trend toward shutdown of old machines will continue, but none predict any of the big jumps that some think are necessary to rectify the present supply/demand imbalance.

St. Regis's Bowersock, however, notes that about 435,000 tpy of capacity was either shut down or converted to groundwood specialties in 1983, three-quarters of that amount in Canada and the balance in the U.S.

Puusepp believes a further 80,000 tpy of capacity will leave the ranks of standard newsprint machines in 1984—all of that in Canada and half of it through upgrading, with the balance being shut down permanently.

One southern U.S. executive predicted a 100,000-ton to 150,000-ton swing out of newsprint through upgrades or shutdowns, without specifying which course will predominate, while several executives did not predict any shutdowns or upgrades this year.

What most do see in the future for newsprint capacity is a shift from spending for higher output to spending for lower costs and higher product quality. Abitibi's Hall cites the impact of the Gannett daily *USA Today* on publisher quality needs and comments "publications have set new newsprint quality targets, and we believe suppliers have recognized the need to meet those targets."

Crown Forest notes that "demand for improved sheet appearance will tend to push producers into state-of-the-art equipment (i.e. twin-wire equipment)."

RISE OF INSERTS. One force behind the move to improve sheet appearance is the recent strength of the newspaper insert market, although most executives seem to feel the newsprint sector of that market will grow at a slower rate than demand for groundwood specialties going into inserts. Bowersock sees an 8% volume rise in preprinted inserts in 1984, with newsprint demand for that end use growing "at a slightly lower rate," while BCFP's Martin forecasts inserts up 5%, with the newsprint portion rising just 2%. Abitibi's Hall actually sees a rise of as much as 10% in the insert market, and Woodworth sees growth in both inserts overall and inserts printed on newsprint at about 5%.

UNCOATED GROUNDWOOD

Enjoying LWC's coattails

During the summer of 1983, uncoated groundwood mills in North America began to ride the crest of a wave that had already started pushing coated groundwood mills ahead during the middle of the year. Executives believe this pickup, which began so suddenly and dramatically, will continue in 1984 barring the unforeseen.

What the unforeseen means to most executives is any significant slowdown in commercial printing without a corresponding increase in newsprint demand. Such a situation would pull uncoated groundwood mills down due to the same overcapacity that hangs over the entire spectrum of groundwood papers.

Observers today are optimistic. Jones Heward & Co. analyst Brian Topp said at *P&P*'s recent *First Uncoated Groundwood Papers Conference* that he expects to see operating rates for Canadian mills hit 91% this year, up from 85% in 1983. His forecast for U.S. mills in 1984 is 90%, up from 85% last year. And he sees both countries' industries running at a healthy 94% in 1985.

St. Regis Corp. senior vice president James Bowersock agrees with Topp's 1983 number for the U.S. but puts U.S. mills at a slightly higher 90.7% in 1984, while CIP Inc. senior vice president W.P. Woodworth is more bullish: he places Canada at 92% this year, up from 90% in 1983, and the U.S. at 94%, up from 92% last year.

COMMERCIAL PRINTING BOOM. This improvement in the industry's operating rate, assuming it happens, will bepowered largely by a growth in commercial printers' demand for advertising and promotional pieces that is proving so strong it has helped the coated groundwood industry absorb a net increase in annual capacity of 578,000 tons between 1981 and 1983. With uncoated groundwood mills adding only about half that amount during those years, the uncoated sector of the groundwood industry was in a good position to serve as a marginal supplier for commercial printers who could no longer secure added amounts of paper in late 1983.

Most industry executives see this trend continuing in 1984. Abitibi's Hall sees U.S. uncoated groundwood consumption rising by 5% to 6% in 1984, and Topp forecasts a rise of 7.2% to 3.4 million metric tons.

Not all of this increase in paper consumption will be supplied by North American sources. Hall places U.S. uncoated groundwood imports from overseas in 1983 at 100,000 metric tons, and adds that "we expect those sources to attempt further penetration as long as their traditional markets remain oversupplied." Most observers cite Finnish and Swedish mills as the major importers of groundwood specialties to the U.S.

Woodworth expects Canadian groundwood mills to increase shipments by 4% in 1984 after a 3% rise in 1983, while Bowersock's estimates for the U.S. call for a 2.7% increase in 1983 and then a jump of 5.7% this year.

Jaakko Pöyry International Oy's Magnus Diesen told the same conference participants that he believes the total North American market for uncoated groundwood papers totals 3.0 million metric tons, of which 1.0 million is rotonews. Of that 1.0 million tons, half goes to "newspapers and magazines" and another 30% goes to "supplements, mail and inserts." North American observers see the insert market for groundwood papers as a fast-growing opportunity, at least in 1984. Estimates of insert volume growth in 1984 range from Woodworth's 5% to Hall's 10%, with a consensus forming around Bowersock's 8% estimate.

And uncoated groundwood is expected to outpace standard newsprint in serving the insert market, with estimates for newsprint growth in inserts ranging from the 2% of British Columbia Forest Products' H.L. Martin to Bowersock's belief of a "slightly lower rate" than the 8% overall increase in inserts. Only Hall offers the opinion that "we don't expect major shifts in the share of newsprint vs groundwood papers."

CAPACITY TRENDS. While major opportunities in the insert, catalog and magazine market do exist, a question does remain in terms of how much money the industry will have available for future capacity expansion or modernization. Topp told conference participants that while "the underlying fundamentals which underwrote the substantial success enjoyed by this 'Super News' segment are still largely in place," peak operating profits during this market cycle are likely to lag those of the last cycle by as much as 15%.

By some estimates, world newsprint capacity is in excess of fundamental demand by 2 million tpy, half of that in North America. Uncoated groundwood has long been seen as a possible alternative market for some of this excessive newsprint capacity—despite the potentially harmful impact that an upgrading of hundreds of thousands of tons of newsprint capacity would have on the uncoated groundwood industry. ■

MARKET PULP

Prices should begin to firm

Rising shipments and declining inventory levels should enable Canadian and U.S. market pulp producers to raise prices in 1984 and restore badly needed profitability, although exchange rates remain a major uncertainty, according to industry observers.

North American and Scandinavian (Norscan) chemical paper-grade pulp shipments through the first nine months of 1983 were up 18.0%, with shipments from Canada up 15.2% from year-earlier levels. Inventories, however, remained relatively high at 1.5 million tons at the end of October, down from 1.6 million tons at the end of 1982 and the recession high of 1.9 million reached in August 1982.

The combination of high inventory levels (mainly for softwood) and the strong U.S. dollar contributed to soft pricing through 1983—particularly in Europe. The rise of the dollar increased the price of pulp for European customers in local currencies and also gave Swedish pulp producers a significant cost advantage and enabled them to price competitively.

As a result, producers achieved little success in bringing the price of benchmark northern bleached softwood kraft (NBSK) pulp up to the list of $440/metric ton in Europe and $450 in the U.S., which was first announced for Mar. 1, 1983. In the fourth quarter of last year, NBSK was still trading in a range as much as $20/ton below list.

INVENTORIES COMING DOWN. Most industry executives and analysts, however, are optimistic that pulp prices will finally begin to firm in 1984.

William H. Vaughan, vice president, market planning and development, BC Timber Ltd., projects that Norscan chemical paper-grade pulp shipments rose to 15.5 million tons in 1983 (just below the record of 15.7 million metric tons reached in 1980) from 1982's recession low of 13.3 million tons, and shipments should go well over 16 million tons in 1984.

Historically, two factors must be present for pulp prices to rise, according to Vaughan. Shipment-to-capacity rates must hit at least 87% on a rising trend in demand, and Norscan inventories must fall to 1.2 million tons or below and be on a downward trend.

"We already have the first condition with the three-month moving average for shipment-to-capacity rates reaching 88% in September and 90% in October," says Vaughn. "My estimate is that Norscan inventories will hit the 1.2-million-ton level in January or February of this year, enabling price increases to stick with a minimum of discounting."

He projects that by the end of 1984 the price of NBSK "will be approaching its previous high and will surpass that level in 1985." The previous peak for NBSK was $545/metric ton in Europe and $530 in the U.S. which was reached in 1981.

EXCHANGE RATE UNCERTAINTY. Ross Hay-Roe, publisher of *PaperTree Letter*, expects acceptance of the recent $50/ton price increase on NBSK to $490 in Europe and $500 in North America that goes into effect Jan. 1, although discounting will not begin to disappear until later in the first half. This will set the stage for another $50 to $60/ton increase at midyear, taking the list price in Europe to around $540, he says. This would result in an average list price for the year of $515, although transaction prices might average closer to $490.

"One of the differences in the current cycle from previous recoveries is the fact that producers haven't minded raising prices even though they are not getting current list prices," Hay-Roe says. The reason for this is the serious need of all producers, with the exception of Swedes, to stem losses and improve profitability.

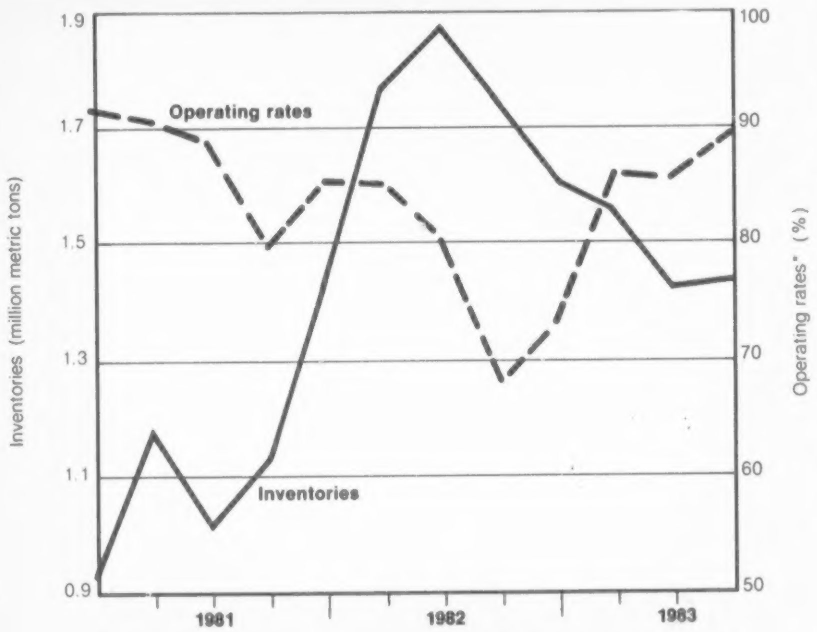
But this points to another unusual feature Hay-Roe sees in the current pulp market recovery. "Assuming the maintenance of current exchange rates, North America is going to be a lot stronger than most other markets and this is going to make it difficult to keep prices up consistently," Hay-Roe notes.

COST PRESSURE IN SWEDEN. "Customers in the U.S. should have no trouble swallowing the $50/price hike announced for Jan. 1, but customers in Europe may choke on it," Hay-Roe says. This will give the Swedes a great incentive to come in and play hero by offering pulp in French francs and Italian lira—and this is already beginning to happen."

Vaughan, however, notes that Sweden accounts for only about 20% of total Norscan pulp capacity and producers there are already beginning to operate full out—which historically has been slightly above the 90% level for a sustained period.

Swedish producers will also face mounting cost pressure, giving them less room to maneuver on prices. "Unlike most businesses, costs for the last few units of production in pulp tend to rise as mills start having to get marginal wood," Vaughan says. "For the Swedes, this means importing woodchips at a high cost from the U.S. or going to landowners who don't really want to sell their timber unless they are paid high prices for it." ■

North American and Scandinavian operating rates and producer inventory levels for chemical paper-grade market pulp, 1981-83



Source: PPW.

* Production as percent of capacity

Growth forecast for world white paper and pulp consumption and Norscan market pulp shipments, 1981-85

	% change from previous year				
	1981	1982	1983e	1984e	1985e
World GNP/GDP	+1.7%	—	+2.5%	+3.5 to 4.2%	+3.0 to 3.5%
Printing/writing paper apparent consumption	—	—	+5.6	+5.2	+5.0
White pulp consumption (integrated and market)	+0.3	−2.1	+4.2	+4.7	+6.4
North American/Scandinavian white market pulp shipments	−5.5	−12.7	+16.5	+11.0 to 14.0	+7.0 to 10.0

Source: William H. Vaughan, BC Timber Ltd.

LABOR

Bargaining to focus on eastern Canada

■ Labor negotiations in Canada will swing again this year to the east from British Columbia—although as this issue of *P&P* was going to press it appeared as if western talks might continue into 1984 and possibly coincide with the expiration of eastern contracts. In the U.S., labor agreements will expire at about 130 mills, with nearly 80 of them in the South and Midwest.

Observers generally feel 1984 may be a tough year for bargaining. As the economies in Canada and the U.S. begin to show pronounced improvements, unions are likely to demand more from industry than in the past two years of recession. Since 1981, unions have agreed to some concessions in an effort to improve industry profitability, but now they are likely to be seeking to recoup their own losses, say some observers.

Already late in 1983, it was apparent that U.S. unions were less hesitant about using strikes as bargaining ploys. The number of strikes as of Nov. 1 increased to 18 from 11 the year before, according to the American Paper Institute. (A strike at St. Regis Corp.'s Monticello, Miss., mill late in November increased the 1983 year-to-date toll to 19.)

In Canada, though, only a few brief and intermittent work stoppages occurred as the industry in British Columbia attempted to reach a settlement with its unions late in the year. Negotiations had dragged on for several months with no apparent progress, but both sides remained reluctant to take drastic action. A lockout initiated by the industry in October, however, idled some pulp mills for several days.

MODERATION IN DEMANDS. In late November, British Columbian employers were still seeking a contract of three years' duration, with no cost increase in the first year and changes in work rules and other operating procedures—such as downtime and holiday time—in an effort to improve efficiency and reduce expenses.

The unions wanted a one-year package with some pay improvements and were resisting any of the industry's proposals for procedural changes.

In eastern Canada, most contracts expire on Apr. 30. The Canadian Paperworkers Union represents most workers in the region. Expiry dates in the U.S. industry—where most employees are members of the United Paperworkers International Union—vary widely.

EASTERN CANADIAN BARGAINING. It appears from preliminary indications a year ago that eastern Canadian companies will be adamant about moderating labor cost increases this year. Last January some employers sought to reopen the second year of the two-year contract ratified in 1982, but the CPU refused. Companies claimed the recession had severely depleted revenues and a one-year wage freeze would have helped maintain competitive positions. The present eastern contract, which took effect May 1, 1982, calls for pay hikes of 12% the first year and 10% the second year.

The CPU has not yet decided on its goals in reaching a new agreement this year. Those will be determined at a conference scheduled to begin Jan. 23. The CPU is by far the largest union in the Canadian paper industry. This year about 25,000 of its members are covered by expiring contracts.

CPU president James Buchanan recently indicated that current economic conditions will be considered when the union determines its agenda for this year. He said that the union has never agreed to concessions but would be "realistic" in setting its goals in 1984.

Unions have been prone to stage extensive strikes in the eastern Canadian industry in prior bargaining years. One of the exceptions was in 1982, when only one mill was idled. It involved Scott Maritimes Ltd.'s 600-tpd bleached kraft pulp mill in Abercrombie Point, N.S., which was struck for several months by the CPU. With the economy improving, though, some observers feel labor strife will be more prevalent this year.

EAST MAY GET PARITY WITH WEST. Negotiations in 1982 were overshadowed by continued weakness in demand for newsprint, groundwood specialties and pulp. Currently, these markets are starting to pick up, with groundwood specialties becoming quite strong, leading some industry executives to suspect that the union will try to get higher wage settlements than two years ago.

Other observers, however, feel the industry will stubbornly adhere to a goal of reducing labor costs to cut losses incurred over the past two years. The agreement ratified in British Columbia will also have an effect.

The CPU will likely include pension plan indexing as a major issue on its agenda again this year. Two years ago, the union was only successful in getting the indexing—which calls for automatic cost-of-living adjustments in pension payments—in its contract at Abitibi.

In past years, eastern Canadian unions have tried to reach wage parity with their western counterparts but haven't succeeded. This year, however, that goal could be realized. If a modest wage increase is included in the contract being negotiated in British Columbia—as is expected—wage rates in the East have a better chance of catching up with wage rates in the West, where the base pay until June 30, 1982 was C$12.96 vs C$12.52 in the East as of May 1, 1983.

U.S. ISSUES. Labor bargaining in the U.S. will focus in the Midwest and Pacific Coast. Labor agreements expire at 18 eastern mills, 28 New England mills, 5 southern mills, 39 midwestern mills, and 40 Pacific Coast mills, according to API.

In recent years, there has been a moderating of U.S. wage increases, and they have remained significantly lower than in Canada. According to API, the average first-year wage increase negotiated in 1983 was highest in the South, at 5.9%, and second highest in New England, 5.8%. It was lowest in the Pacific area, 2.0%.

Richard P. Klinzing, API's vice president of employee relations, feels that the contract settlements of 1982-83 will have a moderating influence on bargaining this year. Health care cost-containment and productivity issues will continue to be high priority items, he notes.

In 1983, depressed order backlogs set the tone for labor negotiations, making it necessary for management to be particularly resolute in resisting union demands for costly benefit changes and unreasonable wage increases, Klinzing notes. "If the economy picks up in 1984, unions will likely be less responsive to management's long-run economic concerns. However, events over the last two years have convinced some that job security and employer profitability are intertwined," he believes.

P&P labor columnist Julian Kien, however, feels 1983 settlements were surprisingly generous given the weak condition of the industry and the modest contracts ratified in other sectors. This resulted in relatively high wage rates in the pulp and paper sector, he believes.

Wayne E. Glenn, UPIU president, said bargaining in 1983 was extremely difficult and unusually time consuming, primarily due to management's attempt to reduce health care coverage and have employees share more of those costs. He feels these items—in addition to wages—will be major issues in 1984.

LOWER LABOR COSTS SOUGHT. Kien feels bargaining in 1984 will be a continuation of 1983—declining wage trends, competitive work practices, and expansion of health care cost-containment programs. He feels both unions and the industry realize there is a need to modify costs and improve productivity.

Glenn, however, doesn't expect contracts ratified over the last two years to have much of an impact on settlements this year. He notes that the last two years were recession years, while 1984 should be a recovery year. He foresees higher wages and better fringe benefits than in 1983 settlements. ■

Major contracts by region on 1984 U.S. paper industry bargaining calendar

Company	Mill location	Union	No. of employees	Contract expires
New England region				
St. Regis	Bucksport, Maine	U,I,B	992	4/30
Intl. Paper	Jay, Maine	U	1,100	5/31
Pejepscot Paper	Pejepscot, Maine	U,I,O	231	6/16
Strathmore (Hammermill)	Turners Falls, Woronoco, Westfield, Mass.	U	457	6/30
Georgia-Pacific	Gilman, Vt.	U	168	7/1
James River	Hyde Park, Mass.	U	166	7/1
GN Nekoosa	Millinocket, E. Millinocket, Maine	U,O A,B,O	1,6[illegible]8 772	7/31 7/31
James River	Fitchburg, Mass.	U,O	482	7/31
Georgia-Pacific	Woodland, Maine	U,A,B,O	299	9/1
Madison Paper	Madison, Maine	A	184	9/15
James River	Old Town, Maine	U	721	9/30
Fraser Paper	Madawaska, Maine	U,O	928	10/31
Eastern Fine	Brewer, Maine	U	374	11/30
Eastern region				
P.H. Glatfelter	Spring Grove, Pa.	U	811	1/16
Intl. Paper	Corinth, N.Y.	U	466	5/31
Hammermill	Erie, Pa.	U	1,348	6/10
Crown Z	Carthage, N.Y.	U	308	6/30
Georgia-Pacific	Lyons Falls, N.Y.	U	218	8/10
Scott Paper	Chester, Pa.	U	1,750	9/27
Garden State	Garfield, N.J.	U	207	10/1
Georgia-Pacific	Plattsburgh, N.Y.	U	515	10/1
Westvaco	Covington, Va.	B	1,132	3/1
James River	Richmond, Va.	U	175	4/27
Bowater Southern	Calhoun, Tenn.	U	1,160	7/2
Champion Intl.	Canton, N.C.	U	1,704	8/31
Midwest region				
Boise Cascade	International Falls, Minn.	U,A,B,O	883	4/30
Consolidated Papers (five divisions)	Stevens Point, Wisconsin Rapids, Wis.	U,A,B,O	2,626	4/30
James River	Green Bay, Wis.	U	965	4/30
Gilbert (Mead)	Menasha, Wis.	U	285	4/30
Crystal Tissue	Middletown, Ohio	U	239	5/1
Georgia-Pacific	Kalamazoo, Mich.	U,O	301	5/1
Nicolet Paper	DePere, Wis.	U	362	5/31
Weyerhaeuser	Rothschild, Wis.	U	370	6/1
Manistique	Manistique, Mich.	U	165	6/15
Potlatch	Brainerd, Minn.	U	573	6/15
Potlatch	Cloquet, Minn.	U,O	954	6/15
Scott Paper	Muskegon, Mich.	U	744	6/15
Appleton	Combined Locks, Wis.	U	534	6/30
Fletcher Paper	Alpena, Mich.	U	150	6/30
Mosinee Paper	Mosinee, Wis.	U	470	6/30
St Regis	Battle Creek, Mich.	A,O	567	6/30
Wisconsin Tis.	Menasha, Wis.	O	483	6/30
Stone Container	Coshocton, Ohio	O	211	7/1
Pope & Talbot	Eau Claire, Wis.	O	631	7/14
James River	Kalamazoo, Mich.	O	964	7/24
Champion Intl.	Ontonagon, Mich.	U	221	7/31
Pope & Talbot	Ladysmith, Wis.	O	156	7/31
Thilmany (Hammermill)	Kaukauna, Wis.	U	1,250	7/31
P.H. Glatfelter	Neenah, Wis.	U	377	8/1
Beckett Paper	Hamilton, Ohio	U	357	10/1
Pacific Coast region				
Southwest For.	Snowflake, Ariz.	U,B	431	3/1
Boise Cascade	Wallula, Wash.	W	442	3/14
Louis.-Pacific	Antioch, Calif.	W	328	3/14
Weyerhaeuser	Cosmopolis, Wash.	W	288	3/14
Weyerhaeuser	Springfield, Ore.	W	462	3/14
Boise Cascade	St. Helens, Ore.	W	504	3/15
Boise Cascade	Vancouver, Wash.	W	295	3/15
Intl. Paper	Gardiner, Ore.	W	209	3/15
ITT Rayonier	Pt. Angeles, Wash.	W	866	3/15
Weyerhaeuser	North Bend, Ore.	W	143	3/15
Weyerhaeuser	Everett, Wash.	W	220	3/15
Weyerhaeuser	Longview, Wash.	W	1,009	3/15
Grays Harbor	Hoquiam, Wash.	W	250	3/15
ITT Rayonier	Hoquiam, Wash.	W	184	3/16
Georgia-Pacific	Bellingham, Wash.	W	810	4/30
Georgia-Pacific	Toledo, Ore.	W	458	4/30
Simpson Paper	Ripon, Calif.	W	17[illegible]	4/30
Boise Cascade	Steilacoom, Wash.	W	185	5/31
Champion Intl.	Missoula, Mont.	U	605	5/31
Longview Fibre	Longview, Wash.	W	1,009	5/31
Louis.-Pacific	Ketchikan, Alaska	B,W,O	396	5/31
Louis.-Pacific	Samoa, Calif.	W	56	5/31
St. Regis	Tacoma, Wash.	U	493	5/31
Crown Z	Antioch, Calif.	W	172	6/1
Crown Z	Los Angeles, Calif.	W	288	6/1
Crown Z	Pt. Angeles, Wash.	W	295	6/1
Crown Z	West Linn, Ore.	W	622	6/1
Scott Paper	Everett, Wash.	W	1,373	6/1
Simpson Paper	Eureka, Calif.	W	170	6/30
Potlatch	Lewiston, Idaho	U,B,O	1,072	6/30

U = United Paperworkers Intl. Union; A = Intl. Assn. of Machinists & Aerospace Workers; B = Intl. Brotherhood of Electrical Workers; W = Assn. of Western Pulp & Paperworkers; O = Other.

Source: American Paper Institute Employee Relations Dept.

ENERGY

More moderation expected in fuel costs

■ Continuing the trend begun in the early 1970s, U.S. pulp and paper companies further reduced their dependence on fossil fuels and other forms of purchased energy in 1983. Adjusted for changes in capacity use, environmental energy use and fuel mix, energy efficiency was up 2.3% in the third quarter compared with a year earlier—and 38.1% compared with 1972—according to American Paper Institute statistics. Self-generated and residual sources of energy accounted for 55.9% of the industry's total energy consumption during the third quarter of 1983, up from 53.8% in the year-earlier quarter, API said.

The paper industry's emphasis on energy efficiency shows few signs of abating over the next several years. A recent *P&P Project Report* survey showed energy-related projects at 29 U.S. and 11 Canadian mills, the majority designed to use woodwastes or other self-generated fuels. In projects where fuel sources were indicated, 58% of the power boilers being installed or proposed for U.S. mills will be able to burn woodwastes. The figure for Canada is 64%.

Another development is the trend to coal, which now runs a close second to natural gas as a source of purchased energy (see table). Of the boiler projects now in the planning stage at U.S. mills, 70% are expected to use coal in their fuel mix.

Underscoring industry's big shift away from oil, only three of the boiler projects noted in the *P&P* survey will use oil as a major fuel source.

ENERGY COSTS STABLE. Natural gas prices declined 1% through October 1983 compared with a year earlier, according to the Bureau of Labor Statistics (BLS), and most observers expect only moderate price increases—compared with recent years—for natural gas in 1984. A panel of energy users predicted that natural gas prices would go up 8% in 1984, while Dept. of Energy officials came up with similar numbers, projecting a 10% increase in the price industrial users pay for natural gas. A recent study by the House subcommittee on fossil and synthetic fuels showed that a majority of major pipeline companies were planning to increase their gas prices by April of this year.

Most analysts feel the current supply surplus, pegged at around 4 to 5 trillion ft^3, will remain through the winter, virtually guaranteeing adequate supplies even if the winter is severe.

The outlook for oil supplies and prices appears relatively stable for 1984, although the Energy Information Administration expects U.S. oil consumption to rise about 6% in first half of 1984. Price hikes for No. 6 fuel oil—along with natural gas one of the paper industry's highest-cost sources of purchased energy—are expected to be minimal, observers report. Dept. of Energy forecasts a 1.4% jump in the price of No. 6 (residual) fuel oil for 1984, while industrial users on average see price increases in the 4% to 5% range. Prices through October 1983 were up 6% from a year ago, according to BLS data.

Coal prices are also expected to be fairly stable in 1984, but the possibility of a strike by the United Mine Workers adds a note of uncertainty to forecasts. Contracts with the UMW covering 80,000 bituminous coal miners expire in September. Members of the UMW have staged strikes of two months or longer at each of the last two bargaining rounds, and many suppliers are reportedly indicating that a strike is a definite possibility.

DECONTROL FIZZLES. 1983 turned out not to be the year for natural gas decontrol, contrary to what many observers had expected. Shortly before the holiday recess, a much-watered-down version of the Administration's decontrol bill died in the House, while the Senate overwhelmingly rejected two opposed bills, one attempting to add more controls to natural gas and the other to remove them.

The Senate vote in particular highlighted the difficulty of breaking the stalemate on this controversial issue and passing a comprehensive natural gas bill. Most observers now feel that the issue is effectively dead until after the November elections.

The Administration bill would have lifted controls mandated by the 1978 Natural Gas Policy Act, which controls "old gas" prices indefinitely but lifts controls in 1985 from "new gas" discovered since 1977. The bill would have gradually phased out price controls on all natural gas over a three-year period and abrogated certain existing contracts binding gas pipeline companies to producers. ■

Estimated fuel and energy use for U.S. pulp, paper, paperboard industry, first six months

	First six months		
Source	1972 % of total	1982 % of total	1983 % of total
Purchased electricity	4.3	6.4	6.2
Purchased steam	1.1	0.7	0.8
Coal	10.9	12.1	13.9
Residual fuel oil	20.9	12.3	11.0
Distillate fuel oil	1.1	0.3	0.3
Natural gas	21.3	17.0	14.0
Other purchased energy	0.2	0.3	0.3
Total fossil fuel & purchased energy	**59.8**	**49.1**	**46.5**
Hogged fuel	2.0	7.6	9.5
Bark	4.5	5.3	5.4
Spent pulping liquor (solids)	33.2	37.2	37.5
Self-generated hydroelectricity	0.4	0.5	0.5
Other self-generated energy	0.1	0.3	0.6
Total self-generated & residue fuels	**40.2**	**50.9**	**53.5**
Total energy	**100.0**	**100.0**	**100.0**

Source: American Paper Institute

through harsh process areas. It has a maximum length of 20,000 ft/branch. The LCN links universal stations to up to 64 other control room modules. Transmission rate is 5 million bits/sec. Gateways perform data conversion, buffering, and processing required for the interchange of data between process-connected devices and the LCN, and between the LCN and the instrumentation subsystems and computers.

Discrete modules. The history module collects and stores the history of events from every controller in the system for access by any device on the LCN. It also stores general files, up to 300 schematic displays, and 36 help displays. Up to 600 process points (plus another optional 600 points) can be stored in each module. Multiple modules can be added where additional storage or redundancy are required.

The application module permits process calculations and control strategies to be implemented that may not be practical or possible using only process connected devices. A powerful control language in the module enables the user to develop and compile application programs and to insert these, as required, into the normal point processing stream. There is no practical restriction on the length of these user-defined programs.

The computing module can be any model from Honeywell's line of DPS 6 computers. It provides sophisticated user programming in Pascal, FORTRAN, or Assembler languages, and is used when developing complex programs that involve input from many controllers and many process conditions. This module also allows the TDC 3000 to interface to networks of DPS 6 and DPS 8 computers structured under Distributed Systems Architecture (DSA) and to networks operating under Systems Network Architecture (SNA). It can also be microprocessor-based for small, unit-level application processing.

Process connected devices. The BASIC Controller has eight control loops; each loop is processed three times/sec. This controller stores 28 algorithms which can be used in any or all of the eight input/output loops. The Extended Controller has 16 computational slots, each of which is processed two times/sec. It integrates sophisticated continuous algorithms with event-oriented capabilities. Both controllers are used in continuous processes. The Multifunction Controller is used to control continuous and discontinuous processes. Incorporating a powerful sequence language, this controller has the flexibility to handle logic interlocking, full batch control (including recipe definition), and alarm management.

Process interface units (PIUs) perform scanning, alarm checking, and storing of process data. Three types of PIUs are offered: high level, low level, and low energy.

A Data Hiway port permits the integration of the TDC 3000 Programmable Controller as well as those using either the Gould-Modicon or Allen-Bradley Protocol.

SYSTEM RELIABILITY. Reliability features include CRC checking, online testing, and parameter validation to ensure that the system performs satisfactorily even if errors occur. The system itself can diagnose most failures and pinpoint them to the optimum replaceable unit level without intervention by the operator or maintenance technician. Security measures include keylocks and areas of responsibility. Terminals and users can be restricted to certain defined tasks. Redundancy of all devices and modules ensures fault tolerance and systemwide backup in the event of a malfunction. ■

For more information, ON READER SERVICE CARD CIRCLE **203**

PROCESS AUTOMATION

PERSONAL COMPUTER SYSTEM PROVES COST-EFFECTIVE TOOL FOR MB MILL

Based on success with small computers at Pine Hill, Ala., MacMillan Bloedel now plans to install a comprehensive linked system

By DAVID L. DeGROOT

■ Until recently, process engineers in a mill had to rely on the mill computer system or have access to shared mainframes for computer time. However, recent advancements in microcomputers have produced units capable of meeting the requirements of a typical technical department at very reasonable costs. In fact, current trends in the small computer industry are leading toward the linking of several small units to provide the power of larger systems but with greater versatility.

With this in mind, the technical services department at MacMillan Bloedel Inc., Pine Hill, Ala., recently purchased a personal computer system. Although the sys-

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Mr. DeGroot is a process engineer at MacMillan Bloedel Inc., Pine Hill, Ala.

TABLE 1: **Computer system justification.**

Engineering productivity increase	
Manpower equivalent	8 manhour/week
Hourly rate (including benefits)	$20/manhour
	x 52 weeks/year
Subtotal	$8,320/year
Secretarial productivity increase	
Manpower equivalent	8 manhour/week
Hourly rate (including benefits)	$7/manhour
	x 52 weeks/year
Subtotal	$2,912/year
Total yearly justification	**$11,232/year**

TABLE 2: **Computer system cost estimate.**

	Computer system		
	A	B	C
Basic computer system (including monitor, keyboard, dual disk drive)	3,995	3,495	3,355
Letter quality printer	1,545	2,800	1,495
Plotter	1,095	1,095	1,095
Software			
BASIC	300	250	300
Word processing	500	395	495
Spreadsheet	250	275	300
Graphics	300	395	350
Total (minimum requirement)	1,350	1,315	1,445
Miscellaneous computer/ printer supplies	500	500	500
Furniture	500	500	500
Total system cost	**8,985**	**9,705**	**8,390**

tem has limitations, it has generally been a tremendous success. Consequently, the department is currently submitting a request for a comprehensive technical department computer system. The proposed system will incorporate several small computers to form a computer network with links to the mill computer system and, in the future, a millwide data freeway.

IMPROVEMENTS WERE NEEDED. Although small personal computers have been in existence for several years, they lacked both the hardware and software to meet engineers' requirements. In addition, the systems did not function well in a mill environment, and service arrangements were inadequate. Thus, engineering requirements were usually met with the more powerful languages like FORTRAN which, until recently, was only available on large computers. However, upgrades in BASIC software on small systems, improved hardware, and system flexibility have changed this situation.

Current BASIC languages for small systems can now handle complicated arithmetic calculations that use numerous variables. BASIC can now manipulate large data files, formatting the output in a manner rivaling FORTRAN. Minimum internal memory (random access memory or RAM) can be expanded to the megabyte range. Virtually unlimited long-term data storage is provided by an array of floppy disks and hard-disk systems. Consequently, small systems can run large programs for manipulating large data files. This capability makes the current generation of personal computers suitable for use in a technical department.

JUSTIFICATION. Justification for a computer system can come in many forms, although its benefits are often difficult to quantify. In general, a new system results in productivity improvements. Some of the benefits obtained by MB's technical service department include:

- Reduction of engineering time required to perform routine calculations or tasks
- Shifting of the routine load to less technically trained personnel
- Reduction in time required to issue reports and develop the monthly report for the department
- Improved engineering report quality and a reduction in time required for report generation
- Freedom from the mill computer system.

As a result, productivity of the entire department was improved. A monetary justification is outlined in Table 1. This is a conservative estimate based on the additional time required to continue the current services provided by the department should the use of the computer be discontinued. When compared with cost estimates for three leading computer systems, shown in Table 2, the information in Table 1 demonstrates that these systems have a very reasonable payback.

A computer system, however, should not be considered a replacement for technical personnel. There will be a short developmental period during which technical department input will be required prior to receiving any benefit from a computer system. In other words, the computer should be viewed as a tool which, when mastered, will extend the capabilities of the user.

GETTING STARTED. Two main questions are always asked when entering the computer market. Which brand of computer should be purchased? And why buy a computer knowing it will be obsolete the next day? These are important questions since the list of computer manufacturers is very long and technology is advancing rapidly. Fortunately, the answers are not difficult.

Although many small computer manufacturers produce suitable equipment, only a few can provide the flexibility and service required for a mill application. The ability of the manufacturer to support computer servicing is a limiting factor and will reduce the number of choices considerably. The capability to communicate with the mill's main computer, if important, will also eliminate several options. In general, the larger, more diversified companies producing a variety of large and small computers will be the best choice as they offer more hardware and software support for their products.

To answer the second question of impending obsolescence, the justification for purchasing a computer must be considered. Once the justification has been established, as outlined in Table 1, the cost in lost productivity or efficiency that results from not using a computer outweighs any savings generated by postponing the computer purchase. In addition, the rate at which a computer becomes obsolete can be reduced by purchasing equipment from major manufacturers that can offer networking capabilities and hardware/software support which can extend the life of a system.

PURCHASING A COMPUTER. After determining system requirements, conduct a literature review of the promotional material from the various computer manufacturers. Pay close attention to software, service arrangements, and the types of peripheral equipment offered. Although it is possible to build a computer system from equipment of several different manufacturers, it is usually best to stay with one product line, especially with regard to service agreements.

Next, contact the representatives of the companies that best meet the established criteria. Explain the requirements and ask the representatives to elaborate on the capabilities of the equipment. Most representatives will coordinate some type of demonstration and can even provide training programs once a system is purchased. Also, have the representative discuss the communication capabilities of the small system with the mill's main computer. Although this function is not initially essential, it may be the key to achieving maximum utilization of a computer system at a future time.

Finally, request a proposal from each equipment supplier. Since the cost of the system is relatively small, it is more important to choose a system that will provide the required functions and will have the greatest hardware/software flexibility. Saving a few dollars comes second in this regard.

The advantages and uses of a computer have been well documented and need not be elaborated upon. But the fact that computer systems with sufficient capabilities to meet the needs of engineers in a technical department are now available for under $10,000 is important. In the past, engineering systems were major budget expenditures which received lower priorities because they were not absolutely necessary (as in accounting systems) and did not have a direct impact on production or profits. However, expenditure of the type required for the small systems discussed in this article can be easily handled on a mill level. These low costs allow small computer systems to be given the priority they deserve, within the financial guidelines of the company. The ultimate objective of providing a technical department staff with the tools required to keep pace with the rapid advances in technology can thus be accomplished. ■

PROCESS AUTOMATION

ONLINE COLOR MEASUREMENT SYSTEM PROVIDES ACCURATE, RELIABLE DATA

Spectrophotometric system has produced good results at several paper mills; high accuracy can mean substantial cost reductions

By GEORGE M. LORDITCH and PETER M. TUTINI

■ During the past several years, online color measurement has evolved from an engineer's dream to a credible and commercially practical system for giving accurate and reliable color information on a cost-effective basis.

While the need and benefits of an online system have been recognized for some time, its recent acceptance has been spurred by successful efforts in three areas: development of the necessary optical sensor technology, successful integration of the system into papermaking, and the achievement of an acceptable return on investment for the instrumentation.

TECHNOLOGY. The Macbeth online system consists of an optical sensor, information processor, color video monitor, data storage, and supporting software packages. The sensor, which is usually mounted between the calender stack and the reel, performs continuous measurements in a fixed position, either over or under the sheet, depending upon the installation. The spectrophotometric measurements are transmitted to a control and display unit which contains a microprocessor, keyboard, and video monitor readout. A remote alarm module signals any out-of-tolerance condition.

The technology required to adapt this system to the paper industry presented several challenges. These challenges included electro-optical design considerations, environmental survival, and online and offline correlation.

Electro-optical. These requirements were particularly complex. Noncontact measurement was essential, as was the capability to optically stop the motion of the sheet so the image would not be blurred. Special consid-

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Mr. Lorditch is technical director and Mr. Tutini is marketing manager of Macbeth Color Communications, Newburgh, N.Y.

MANAGEMENT

Naval stores industry in a slump despite world economic recovery

Speakers at 10th International Naval Stores meeting detailed the industry's woes of reduced demand for its products, low growth prospects

By KENNETH E. SMITH, Executive Editor

■ More than 200 delegates at the 10th Annual International Naval Stores meeting in Atlanta, Ga., last September heard 15 speakers portray a rather grim outlook for the naval stores industry. Not only had the depressed world economy cut demand for naval stores products, but also many of the industry's customers were finding more attractive substitutes for naval stores products—especially rosin. This situation was reflected in declining third-quarter crude tall oil (CTO) prices as fractionators struggled with high tall oil rosin (TOR) inventories and competition from imported gum rosin from China and Portugal. U.S. rosin inventories stood at more than 63 million lb, forcing fractionators to cut back production or idle capacity.

The expected increase in CTO production as the U.S. paper industry began to resume prerecession output levels did not promise to help the market either. However, at the year-end price of around $120/ton, CTO could be profitably burned as a fuel-oil substitute by some pulp mills. Even so, prices were likely to remain unchanged for several months. Crude sulfate turpentine producers were also burning their production as a substitute fuel, as sulfate turpentine prices had declined to 60¢-65¢/gal from a high in 1981 of $1.90/gal. Sulfate turpentine inventories stood at 3 million gal at the beginning of the fourth quarter.

There was some good news for the industry as at least one producer announced price hikes for its tall oil fatty acid (TOFA) grades, which were slated to take effect in the fourth quarter.

PAPER SIZING TRENDS. Brookshire C. Moore, president of Brookshire C. Moore Associates, explained to delegates the reasons for the declining use of rosin for paper sizing. Moore said that in 1950 the U.S. paper industry used rosin for sizing at a rate of about 16 lb/ton of production. Today, according to Moore, the industry uses only about 4 lb/ton. Altogether, rosin use for paper sizing has declined from 280 million lb in 1950 to 150 million lb in 1982. Reasons cited for this decline were:

- Today's rosin emulsion sizes are more efficient than soap sizes
- Kraft pulping now dominates the industry, and paper made from kraft pulps is easier to size than sulfite pulps
- Improved paper machine additive retention levels and closed whitewater systems reduce size addition requirements
- Computers allow more precise control of paper machine additive addition
- Ball-points have replaced fountain pens as the standard writing instrument, reducing fine paper sizing requirements
- Alkaline sizing technology is becoming more widely accepted and replacing rosin sizing in many uses

Moore noted that hard-sized linerboard, which required rosin addition in the 75- to 100-lb/ton range in 1950, today requires only 12 to 15 lb/ton of rosin.

About 40% of the European printing and writing papers industry is currently using alkaline sizing, allowing the industry to go from filler loadings of about 10% clay to 25% or more of calcium carbonate with equivalent paper performance. U.S. papermakers, who have access to cheaper clay fillers, have not accepted alkaline papermaking as readily. Only about 7% to 8% of the U.S. fine paper industry is currently using alkaline sizing systems. However, Moore predicted that 30% to 40% of the U.S. industry would convert to alkaline papermaking within the next decade.

PRINTING INK TRENDS. Richard E. France, vice president of Sun Chemical Corp., discussed changes in printing ink technology as they have affected rosin size demand. According to France, the U.S. printing ink market is currently a $1.7-billion/year business, and about 3% growth is expected for the next five years. The main growth area is in publication gravure and heatset web-offset inks.

France noted that publication gravure inks remain a large market for resinates based on TOR. However, in Europe a significant percentage of these ink formulations utilize large amounts of special hydrocarbon resins in conjunction with rosin-based materials. The advantages appear to be high gloss, better scuff resistance and better wetting of certain pigments. He predicted the same development in the U.S. once hydrocarbon resins corresponding to the European materials are available. France emphasized that rosin producers must continue to upgrade their products destined for the publication gravure market because they could be severely challenged by hydrocarbon resins in the near future.

Hydrocarbon resins have made massive inroads in the area of high-efficiency heatset web-offset inks for improved gloss on lower-weight coated paper. Only two years ago this market was completely dominated by rosin-based materials, but today half this area has been lost to hydrocarbon resins. These newer hydrocarbon resins made it possible for ink makers to meet printers' requirements for high efficiency, lower maintenance and much higher press speeds.

In the high-performance cover ink area—the high solids formulations and high holdout tabloid inks—ink formulations are still based mainly on rosin resins. The biggest growth is in the high holdout tabloid inks that are replacing publication gravure in many markets. This area is also potentially an excellent opportunity for hydrocarbon resin intrusion.

France noted that the heatset offset market will probably be the highest ink growth area during the next five years, and that rosin resin producers must respond with new technology if they are to hold their current market levels, let alone increase sales volume. This growth area presents an opportunity to blend rosin chemistry with hydrocarbon chemistry to develop hybrid products that would have advantages over each technology.

Commenting on sheetfed offset inks, currently the second largest U.S. ink market, the speaker noted that this market in the U.S. as well as other parts of the world is going through a slow decline. Higher-speed rotary lithographic presses can produce high-quality work at much higher speeds. However, the sheetfed market will continue to be significant, and is largely based on rosin-based ink systems. Hydrocarbon resins are used but in small quantities.

ADHESIVE TECHNOLOGY. Robert W. Wherry, resins market manager for Hercules Inc., discussed the effect of changing adhesives technology on rosin demand. Wherry noted that two changing technological factors in adhesives manufacture will affect the demand for naval stores derivatives: the backbone polymer and the adhesive application method. Manufacturers have begun using block copolymers, polyethylene, and acrylics while moving away from natural and synthetic rubber polymers. The type of polymer used affects the polymer modifier used. Many of these polymer modifiers are made from sulfate terpenes (alpha and beta pinenes, turpentine and wood terpenes), citrus peel or stripper oil, rosin oil, and even from pitch itself. However, petroleum hydrocarbon derivates have become more popular recently. In block copolymer hot-melt systems a C_5 aliphatic hydrocarbon resin is the preferred modifier in many end uses. The C_5 polymer has better initial color stability, less odor, and has had a more stable availability and price history than rosin-based resins.

The most recent development in applications technology is foam. Foamed adhesives use air to extend the adhesive mass. The obvious impact of foaming is that the process reduces the amount of all ingredients needed to produce the adhesive.

Wherry concluded that the demand for naval stores derivatives in adhesives has peaked and that any growth in this area will probably be met by hydrocarbon resins. New naval stores products are needed that are price competitive, pale colored, stable, and have the proper solubility/compatibility for each particular polymer if naval stores are to regain their lost market share.

WORLD ROSIN SITUATION. Walter L. Cleaver, president of PDM Inc., described the rosin supply and demand picture in the U.S. and the history of the U.S. rosin industry. Cleaver presented figures (Table 1) for U.S. production of gum, wood and TOR. The U.S. gum rosin industry has almost disappeared due to its labor-intensive nature. Only an estimated 4,500 tons of gum rosin were produced in the U.S. in 1983. Gum rosin imports into the U.S. from China, Portugal, Mexico, Nicaragua and Honduras amounted to an estimated 30,000 tons (Table 2) the same year.

TOR accounts for more than two-thirds of U.S. rosin production (Table 3), and plays a vital role in the supply, demand and economics of the world naval stores indus-

TABLE 1: **U.S. rosin production (000 tons).**

	1964	1973	1983
Gum	98	20	4.5
Wood	260	175	100.0
TOR	146	220	205.0
Total	**504**	**415**	**309.5**

TABLE 2: **U.S. gum rosin situation (tons).**

	Production	Exports	Difference	Imports
1979	6,000	4,500	1,500	12,150
1980	5,886	3,596	2,290	8,000
1981	5,095	2,833	2,262	5,500
1982	4,500	2,126	2,374	4,900
1983 (6 mon)	2,000	1,456	544	15,000

TABLE 3: **U.S. tall oil rosin situation (000 tons).**

	TOR production	Domestic use	Exports	TOR beginning inventory	TOFA beginning inventory	CTO beginning inventory
1977	201	164	27.5	19.5	13.5	54.1
1978	212	176	37.5	30.5	17.7	50.9
1979	232	195	49.0	29.0	26.0	72.5
1980	224	186	43.0	15.0	25.9	61.9
1981	222	185	26.0	8.0	64.3	61.2
1982	195	169	17.5	19.0	47.9	72.6
1983e	205	185	15.0	27.0	28.9	89.0
1984e	210	195	25.0	32.0	20.0	100.0

try. However, Cleaver also noted gum rosin represents more than half of the world's rosin needs. With labor costs likely to increase in the producing areas of the world, the cost of gum rosin is likely to drift up, further extending the life expectancy of the existing wood rosin industry, and may support new wood rosin operations where ideal labor and stumps and/or timber stands can be profitably developed.

Wood rosin production is currently controlled on an "as needed" level of roughly 100,000 tons/year with a comfortable supply of stump stocks and capable of a short notice, sharp increase in production. The life expectancy outlook of wood rosin producers has improved substantially with a successful extended commercial evaluation of paraquat stimulation to generate high resin stumps from greenwood after two or three years of treatment.

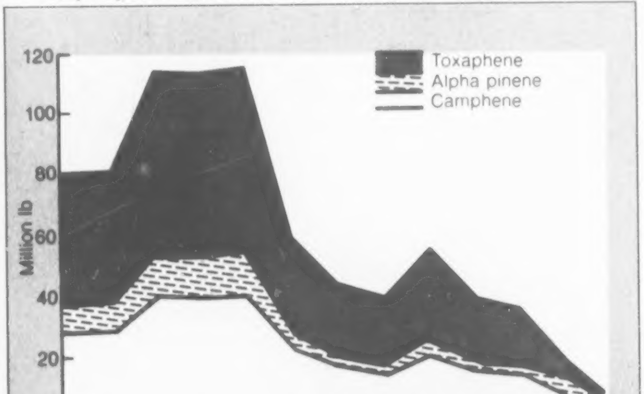
Antonio J. Ferreira, president of Sociedade Central Resinas, Lisbon, Portugal, gave a summary of the gum rosin production outlook in his country. Ferreira noted that Portugal has a forest area of 7.4 million acres, nearly half of which is pine. The production of crude gum rosin in the 1982-83 season was an estimated 140,000 tons, which distills out to 107,000 tons rosin and 25,000 tons turpentine. In the 1981-82 season 136,000 tons of crude gum were distilled to 101,000 tons of rosin and 23,000 tons of turpentine. Portuguese rosin exports in 1982 were 100,000 tons, and in 1981, 81,000 tons. The rosin market price in November 1982 was about $390/ton.

The rosin supply situation in Japan was the subject of a presentation by Yoshihiro Hasegawa, director of Harima M.I.D. Inc., Osaka, Japan. Hasegawa noted that for the last five years Japan has imported annually an average of 69,000 tons of CTO, 64,000 tons of rosin, and 7,000 tons of turpentine.

Imports account for approximately 73% of all rosin use in Japan. About 60% of the rosin imports are gum rosin from China. Much of the remainder of Japan's rosin requirements are met with TOR imported from the U.S. And about 24,000 tons of TOR are produced annually by the country's pulp mills. The amount of rosin imports depends largely on the pricing and availability of Chinese gum rosin.

Total Japanese rosin consumption dropped from 80,000 tons in 1981 to 77,000 tons in 1982. In particular, a sharp decline in rosin use was seen in the paper industry, which has decreased its use of rosin from an all-time high of 33,000 tons to about 22,000 tons at present. The rubber emulsifier industry has also decreased its use of rosin from 22,000 tons to about 17,000 tons at present due to a decrease in synthetic rubber production. However, this area is likely to recover. Rosin consumption will begin increasing 2,000 to 3,000 tons annually in the adhesives industry due to a shift from conventional solvent-type adhesives to emulsion types, which is presently occurring. The speaker concluded by saying that he does not see any other great changes in rosin consumption, but that by 1985 annual rosin consumption in Japan will be 88,000 tons.

FIGURE 1: **Toxaphene production and its effect on alpha pinene and camphene use.**



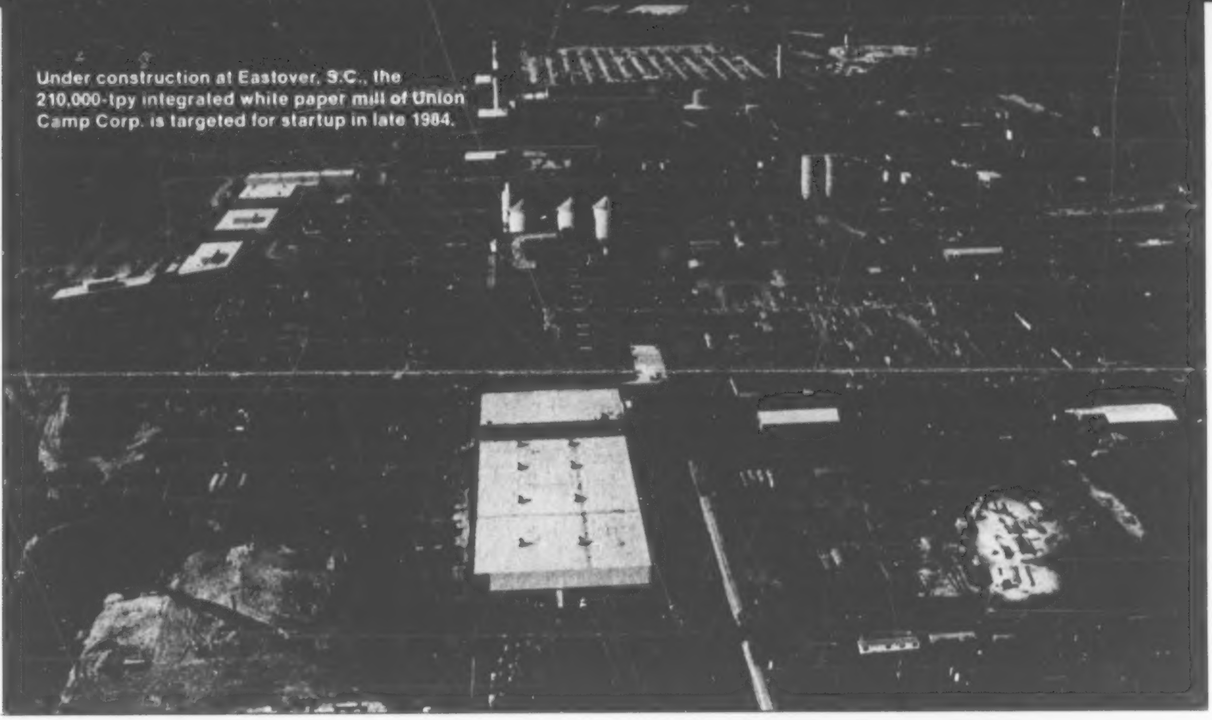
TURPENTINE, PINE OIL OUTLOOK. Maurice J. Kelley, product manager for Hercules, reported on U.S. crude sulfate turpentine production. Kelley said that sulfate turpentine production has remained relatively flat for the past 20 years at about 22 million gal/year. Production for 1983 is estimated at 21.3 million gal, and peak production occurred in 1980 when 25 million gal were produced. Gum turpentine production has decreased to about 314,000 gal/year, and wood turpentine production is now less than 2 million gal/year.

Future sulfate turpentine production is expected to remain relatively flat at about 21 million gal/year, with a slight growth rate of 1% to 2%/year. The negative effects of pulp mill use of stored chips, hardwoods, and continuous digesters has essentially leveled out, so there should be no substantial loss of production in the future.

One of the major uses for turpentine in recent years has been in the production of the insecticide Toxaphene. At its peak, the production of Toxaphene required 39.5 million lb/year of camphene and 55 million lb/year of alpha pinene gum and wood turpentine (see Figure 1). However, the Environmental Protection Agency has recently banned Toxaphene and none was produced in 1983. This has released substantial amounts of turpentine for other uses. Analysts estimate that the EPA ban reduced the total turpentine market by about 16%.

According to Donald Broome, purchasing agent for American Cyanamid Co., synthetic and steam-distilled pine oil production in the U.S. has declined to a level of 60 million lb/year. He also commented that this figure may be misleadingly high as these production figures include all grades or percents of terpene alcohol pine oils, and production has generally shifted from 80%-85% to 60% terpene alcohol pine oil in cost-cutting efforts by producers.

Almost 70% of the synthetic and steam-distilled pine oil produced in the western world is produced in the U.S., and 90% to 95% of U.S. consumption goes into household liquid cleaners and disinfectants. Broome expects the use of pine oil and pine oil liquid cleaners in the U.S. to continue to grow at a moderate rate for the next two years. But the use of pine oil for household cleaners in Latin America, the most important export market, is expected to decline, and the pine oil export business to Latin America will probably cease to exist within the next few years. With increased production coming on stream in Europe, U.S. pine oil exports to Europe may have continued difficulty competing in that market. ■



Under construction at Eastover, S.C., the 210,000-tpy integrated white paper mill of Union Camp Corp. is targeted for startup in late 1984.

CAPITAL SPENDING

1983-85 U.S./Canadian spending plans emphasize incremental expansions, better energy use

By STEPHANIE POLLITZER, Consulting Editor

■ The economic realities of the recent business climate in North America are reflected in *Pulp & Paper*'s annual survey of spending plans at U.S. and Canadian pulp and paper mills. The expenditures reported to *P&P* for this 1983-85 survey total $9.7 billion, a substantial drop (28%) from the $13.5 billion listed a year ago.

Stretch-outs and indefinite postponements for projects planned have been announced by both U.S. and Canadian mills, but few announced projects have been canceled outright. New projects announced in 1983 have tended to focus on upgrading existing facilities. No new proposals for greenfield mills were made in 1983; however, plans were announced for a number of new paper and board machines in both U.S. and Canada.

U.S. spending. Officially, capital spending at U.S. pulp and paper mills in 1983 was expected to be $6.19 billion, according to a U.S. Dept. of Commerce survey conducted in July and August. This represents a 3.7% increase from the $5.97 billion spent in 1982. McGraw-Hill Economics' annual fall spending survey (issued November 1983) estimates U.S. paper industry spending in 1983 at $6.86 billion, up 14.9% over 1982. This higher estimate could reflect the midyear upturn in the economy, which has also been noted in recent mill announce-

REPORTED SPENDING 1983-85+, BY TYPE OF FACILITY[1]

UNITED STATES		
Wood/fiber	$ 383,034,000	6%
Pulping	1,326,246,000	20%
New machines	307,000,000	5%
Machine modifications	682,195,000	11%
Energy/power	1,768,913,000	27%
Miscallaneous/plant	1,366,149,000	21%
PRODUCTION TOTAL	$5,833,537,000	90%
Water quality	$ 251,790,000	4%
Air quality	357,240,000*	6%
Solid wate/unspecified	28,200,000	0%
ENVIRONMENTAL TOTAL	$ 637,230,000	10%
TOTAL SPENDING	$6,470,767,000	100%
CANADA		
Wood/fiber	C$ 124,343,000	3%
Pulping	1,234,857,000	36%
New machines	215,000,000	5%
Machine modifications	475,717,000	14%
Energy/power	361,630,000	11%
Miscaiianeous/plant	754,699,000	19%
PRODUCTION TOTAL	C$3,166,246,000	88%
Water quality	C$ 216,100,000	6%
Air quality	189,125,000	6%
Solid wate/unspecified	5,083,000	0%
ENVIRONMENTAL TOTAL	C$ 410,308,000	12%
TOTAL SPENDING	C$3,576,554,000	100%

1. Includes projects as announced for completion in 1986 and later, as reported by *Pulp & Paper Project Report*.
2. Dollar figure includes an estimated $1,018,000,000 for projects to be completed in 1986 and later ($977,000,000 production; $41,000,000 environmental).
3. Dollar figure includes an estimated C$502,000,000 for projects to be completed in 1986 and later (C$385,000,000 production; $C117,000,000 environmental).

ments for reinstatement of postponed projects (largely for big-cost energy and power programs) and in proposals for new machines (four in the U.S. since mid-October). For 1984, McGraw-Hill forecasts an 8.4% increase in U.S. paper industry spending (to $7.44 billion) and an even larger increase of 22.1% in 1985 (to $9.80 billion).

Canadian spending. Data from the latest Statistics Canada spending survey shows pulp and paper companies expect to reduce 1983 capital expenditures to C$1.02 billion, a substantial drop from the 1982's $1.83 billion.

ABOUT THE SURVEY DATA. The tables and lists in this report are compiled from *P&P*'s annual survey of expansion/modernization programs at U.S. and Canadian mills. The dollar figures represent the total cost of the reported projects and sometimes may include supporting equipment. The total cost is assigned to the startup year—not to year(s) of expenditure.

Every effort is made to have the *P&P* annual spending survey be as complete and accurate as possible. Some companies make no public announcements of capital-investment programs, and other firms do not release financial information for announced programs. Thus it is recognized that *P&P*'s survey data is incomplete.

Information is compiled from the many companies that do report their programs in detail, and also from other information that has been publicly released. The data does not normally include spending for woodlands or for offsite converting facilities.

Assignment of cost data to the various categories (for example: pulping, or energy/power) is based on data from companies, if available. In cases where cost is not designated by the reporting companies, the figures for the various categories reflect an estimate by *P&P* staff.

Basic rules followed in assigning cost data to the categories include the following: recovery boilers are listed under "pulping" unless identified as an "environmental" project; large multimillion-dollar projects for a new machine or greenfield mill are divided into the appropriate categories, presuming a reasonable assumption of proportionate costs; "miscellaneous" includes identifiable stock preparation, coating and finishing operations as well as plant and building structure, and unidentifiable projects reported as miscellaneous.

SEVEN-YEAR CAPITAL SPENDING TRENDS

UNITED STATES

P&P's reported three-year spending ($ billion)

Year	Period	Production	Environment		Total	Annual capital expenditures[1]
			Water	Air		
1984	1983-85	$4.857[2]	$0.271[2,3]	$0.325[2,3]	$5.452[2]	$ (6.7)[4]
1983	1982-84	6.095[2]	0.376[3]	0.460	6.931[2]	6.19
1982	1981-83	6.216[2]	0.635[3]	0.677	7.528[2]	5.97
1981	1980-82	7.783[2]	0.531	0.568	8.882[2]	6.72
1980	1979-81	8.003[2]	0.515	0.360	8.001[2]	6.80
1979	1978-80	4.911	0.350	0.251	5.759[5]	5.55
1978	1977-79	4.431	0.611	0.307	5.489[5]	4.41

1. Based on data from U.S. Commerce Dept.
2. Based on *P & P* survey for 3-year period; not comparable to U.S. Commerce data since *P & P* information can include only data that has been released publicly. Please note: 1984 data does not include $1.018 billion for projects to be completed in 1986 or later ($0.977 billion production; $0.041 billion environmental); 1983 data does not include $1.292 billion for projects to be completed in 1985 or later; 1982 data does not include $2.8 billion estimated for projects to be completed in 1984-86; 1981 data does not include $1.150 billion estimated to be spent in 1983-85; 1980 data does not include $0.877 billion estimated to be spent in 1982-85.
3. 1984 data includes $0.028 billion for "solid waste/unspecified;" 1983 data includes $0.015 billion for "solid waste/unspecified;" 1982 data includes $0.050 billion for "solid waste."
4. *P & P* estimate.
5. Includes unallocated funds of $0.246 billion for 1979 and $0.140 billion for 1978 surveys.

CANADA

P&P's reported three-year spending (C$ billion)

Year	Period	Production	Environment		Total	Annual capital expenditures[1]
			Water	Air		
1984	1983-85	C$3.166	C$0.221[3]	C$0.189	C$3.577	C$ (2.0)[4]
1983	1982-84	3.990	0.295	0.272	4.557[2]	1.07
1982	1981-83	3.949[2]	0.438[3]	0.365	4.752[2]	1.83
1981	1980-82	3.645[2]	0.303	0.329	4.277[2]	2.18
1980	1979-81	2.440[2]	0.187	0.135	2.078[2]	2.11
1979	1978-80	1.462	0.110	0.113	1.685	1.55
1978	1977-79	1.442	0.166	0.112	1.720	1.26

1. Data from Statistics Canada; includes capital and repair expenditures for equipment and facilities.
2. Based on *P & P* survey for 3-year period; not comparable to Statistics Canada data since *P & P* information can include only data that has been released publicly. Please note: 1984 data does not include C$0.502 billion for projects to be completed in 1986 and later (C$0.385 billion production; C$0.117 environmental); 1983 data does not include C$0.697 billion for projects to be completed in 1985 and later; 1982 data does not include C$0.814 billion estimated for projects to be completed in 1984-86; 1981 data does not include $0.643 billion estimated to be spent in 1982-85.
3. 1984 data includes C$0.005 billion for "solid waste;" 1983 data includes C$0.002 billion, and 1982 data includes C$0.031 billion designated for "solid waste" control.
4. *P & P* estimate.

UNITED STATES

Industry targets productivity, costs; South leads in spending plans

■ Scars from the recent recessionary economy can be identified in the lowered projected expenditures of the U.S. pulp and paper industry reported in *P&P*'s 1983-85 survey. The $6.47 billion total spending for U.S. mills (the lowest since 1979) includes $1.0 billion for programs for 1986 and later. It does not include programs that have been proposed but for which no startup date has been set.

The new survey shows increased emphasis on incremental production expansions through rebuilds and modifications of existing equipment. Planned expenditures for new paper machines are down to 5% of the industry total (compared with 8% a year ago), and expenditures for paper machine modifications are 11% of the total (from 6% last year). This emphasis on machine modifications is the major shift from earlier survey reports. Percentage of total reported spending in any other category does not deviate more than 1% from last year.

THE ACTION IS IN THE SOUTH. The *P&P* 1983-85 survey reports pulp and paper spending programs of $4.2 billion for states in the South (three Census southern regions); this is 65% of the U.S. total (up from 63% last year). More than $1 billion is reported for two southern states: South Carolina ($1.226 billion) and Alabama ($1.1 billion). These two states were also Nos. 1 and 2 in the 1983 survey. Other leading southern states are Mississippi ($641 million) and Georgia ($344 million).

The second-ranking region is the Midwest (two Census regions), reporting $998 million, 15% of the U.S. total (down from 20% in the 1983 survey). Michigan leads in the Midwest ($546 million), followed by Wisconsin ($324 million).

Spending programs in the West (Mountain/Pacific

TOP SPENDERS IN U.S.

Companies which have reported capital spending plans of $100,000,000 or more, including both production and environmental programs

	1983-85	**1982-84**
Champion International	$733,380,000*	$796,780,000*
Great Northern Nekoosa	600,450,000	582,120,000
Union Camp	591,307,000	744,800,000
International Paper	540,000,000	600,000,000
Crown Zellerbach	454,000,000	420,000,000*
Scott Paper	435,200,000	431,000,000*
Abitibi/Augusta Newsprint	255,339,000	242,205,000
Weyerhaeuser	244,000,000*	603,460,000
St. Regis Corp.	222,915,000*	566,862,000
Bowater North America	148,910,000	149,670,000
Fort Howard Paper	132,000,000*	40,000,000
Hammermill Paper	130,722,000	178,648,000*
Westvaco	129,100,000	100,000,000
Pentair Industries	121,715,000*	115,271,000

*Includes programs for completion beyond 3-year period indicated.

Total cost of a multiyear project is assigned to year of startup.

SUMMARY OF U.S. PROJECTS— REPORTED EXPENDITURES, 1983-85+[1] BY STATES (000 dollars)

STATE	**PRODUCTION**	**ENVIRONMENTAL**	**TOTAL**
Alabama	$1,016,058	$ 58,008	**$1,074,066**
Arkansas	25,320	2,100	**27,420**
California	29,700	—	**29,700**
Connecticut	32,623	—	**32,623**
Florida	180,750	13,800	**194,550**
Georgia	306,629	37,900	**344,429**
Idaho	8,779	—	**8,779**
Indiana	1,081	—	**1,081**
Kentucky	40,750	—	**40,750**
Louisiana	92,000	15,250	**107,250**
Maine	244,563	15,300	**239,863**
Maryland	—	2,100	**2,100**
Massachusetts	7,000	—	**7,000**
Michigan	469,600	76,800	**546,400**
Minnesota	51,847	10,822	**62,669**
Mississippi	556,100	85,000	**641,100**
Missouri	8,000	—	**8,000**
Montana	7,600	—	**7,600**
New Hampshire	45,175	—	**45,175**
New York	14,300	350	**14,650**
North Carolina	84,380	19,300	**103,680**
Ohio	51,657	3,835	**55,492**
Oklahoma	90,000	—	**90,000**
Oregon	46,639	645	**47,284**
Pennsylvania	49,622	25,600	**75,222**
South Carolina	1,093,410	133,040	**1,226,450**
Tennessee	64,500	15,500	**80,000**
Texas	154,364	26,300	**180,664**
Virginia	64,867	8,325	**73,192**
Washington	709,800	65,000	**774,800**
West Virginia	650	4,170	**4,820**
Wisconsin	305,773	18,085	**323,858**
Total	**$5,833,537**	**$637,230**	**$6,470,767[2]**

1. Includes projects, as announced, for completion in 1986 or later.
2. Dollar figure includes estimated $1,018,230,000 for projects to be completed in 1986 and after ($977,000,000 production; $41,000,000 environmental.

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN U.S.

(over $50,000,000 at an existing mill site)

Abitibi/Augusta Newsprint, Augusta, Ga.	$256,900,000*
Alton Packaging, Jacksonville, Fla.	56,000,000
Appleton Papers, Combined Locks, Wis.	54,900,000†
Bowater Carolina, Catawba, S.C.	71,200,000
Champion International, Courtland, Ala.	127,500,000*
Chesapeake Corp., West Point, Va.	57,500,000
Container Corp., Fernandina Beach, Fla.	75,000,000
Crown Zellerbach, Camas, Wash.	425,000,000*
Fort Howard, Muskogee, Okla.	90,000,000*†
Hammermill, Selma, Ala.	127,000,000
International Paper, Bastrop, La.	64,000,000
International Paper, Georgetown, S.C.	+450,000,000
Kimberly-Clark, Coosa Pines, Ala.	74,500,000
Longview Fibre, Longview, Wash.	78,000,000
Pentair/Niagara, Niagara, Wis.	84,000,000†
St. Regis Corp., Bucksport, Maine	87,731,000†
St. Regis Corp., Lufkin, Texas	95,666,000†
Scott Paper, Mobile, Ala.	369,000,000
Westvaco, Charleston, S.C.	90,000,000
Weyerhaeuser, Longview, Wash.	192,000,000†

*Includes new paper machine (also in listing of New Machines).
†Includes programs for completion in 1986 and later.

Data in this table necessarily omits expansion programs for which cost information has not been released.

states) are reported at $868 million, 14% of the U.S. total (up substantially from last year's 9%). Most of the West's expenditures will occur in Washington ($775 million).

In the Northeast (two Census regions), most of $415 million reported will be spent in Maine ($240 million).

SPENDING BY CATEGORIES. As indicated earlier, the major change in the results reported in *P&P*'s 1983-85 survey is the enlarged emphasis on upgrades and retrofits of paper machines. The $682 million outlay for machine modifications reported in the current survey is more than double the $307 million shown for acquisition of new machines. In the preceding survey, machine modifications represented less than 80% of expenditures for new machines; in three earlier surveys (1980-82) budgets for rebuilds had averaged 54% of new machine spending.

Expenditures for energy and power facilities continue to be the largest component of the industry's modernization/expansion bill, with $1.8 billion listed for this category (27% of total spending reported).

Environmental quality programs represent 10% of total industry spending as reported in the 1983-85 survey. This is the same level (10%) as in last year's survey. Expenditures for air quality ($357 million) outrank those for water quality ($252 million) as they have done for the last four surveys. Solid waste programs represent only a modest expense for the industry ($28 million in the 1984 survey).

NEW MILLS AND MACHINES. Three greenfield mills are under construction in the U.S., two of them targeted for startup in 1984. At Eastover, S.C., the 210,000-tpy bleached pulp/white paper mill of Union Camp Corp. is scheduled to come online in September. Also due for 1984 startup is the Great Northern Nekoosa Corp./Leaf River Forest Products 350,000-tpy bleached kraft market pulp mill at New Augusta, Miss. A second market pulp mill, heading for 1986 operation, is Champion International Corp.'s 265,000-tpy hardwood kraft mill at Quinnesec, Mich. Not yet under construction but promised for 1985 startup is the 280,000-tpy kraft linerboard mill of Independent Kraft Corp., to be built at Tuscaloosa, Ala. Other greenfield mills that have been proposed but do not have an established startup date are show in the "Greenfield Mills" list.

Eight new machines came online in 1983 or will start up in 1984 at U.S. mills. Three of the 1983 starters were small units to produce fiberglass mat for roofing felt mills. Champion started up a 140,000-tpy uncoated free-sheet machine at Courtland, Ala., in July. Augusta Newsprint (an Abitibi-Price Inc./Thomson Newspapers Ltd. joint venture) brought its 226,000-tpy newsprint machine at Augusta, Ga., online in October. Due to start-up in 1984 are two uncoated free-sheet machines: a 160,000-tpy unit for Crown Zellerbach, Camas, Wash.,

UNITED STATES—REPORTED CAPITAL EXPENDITURES FOR 1983-85+[1] BY REGIONS AND BY TYPE OF FACILITY ($000)

	PRODUCTION-RELATED EXPENDITURES											
	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
New England	$ —	0%	$ 14,200	1%	$ —	0%	$ 100,394	15%	$ 144,727	8%	$ 49,500	4%
Mid-Atlantic	—	0%	—	0%	—	0%	32,350	5%	29,500	2%	2,072	0%
East North Central	45,000	12%	264,100	20%	10,000	3%	171,638	25%	92,685	5%	244,688	18%
West North Central	—	0%	—	0%	8,000	2%	31,865	5%	13,500	1%	6,482	0%
South Atlantic	115,634	30%	295,097	22%	97,000	32%	162,183	24%	754,780	37%	405,992	30%
East South Central	207,000	54%	409,900	31%	122,000	40%	78,750	11%	538,300	30%	321,458	24%
West South Central	—	0%	15,300	1%	25,000	8%	32,168	5%	189,321	11%	99,895	7%
Mountain/Pacific	15,400	4%	327,649	25%	45,000	15%	72,307	10%	106,100	6%	236,062	17%
Total	**$ 383,034**		**$1,326,246**		**$ 307,000**		**$ 682,195**		**$1,768,913**		**$1,366,149**	

	ENVIRONMENTAL QUALITY SPENDING						TOTALS:					
	WATER		AIR		WASTE/UNSPEC.		PRODUCTION		ENVIRONMENT		GRAND TOTAL	
New England	$ —	0%	$ 13,800	4%	$ 1,500	5%	$ 309,361	5%	$ 15,300	2%	$ 324,661	5%
Mid-Atlantic	350	0%	25,600	7%	—	0%	63,922	1%	25,950	4%	89,872	1%
East North Central	36,375	15%	62,345	18%	—	0%	828,111	14%	98,720	16%	926,831	14%
West North Central	—	0%	7,222	2%	3,600	13%	59,847	1%	10,822	2%	70,669	1%
South Atlantic	90,340	36%	117,495	33%	10,800	38%	1,730,686	30%	218,635	34%	1,949,321	30%
East South Central	78,410	31%	74,948	21%	5,150	18%	1,677 408	29%	158,508	25%	1,835,916	29%
West South Central	10,800	4%	25,700	7%	7,150	26%	361,684	6%	43,650	7%	405,334	6%
Mountain/Pacific	35,515	14%	30,130	8%	—	0%	802,518	14%	65,645	10%	868,163	14%
Total	**$ 251,790**		**$ 357,240**		**$28,200**		**$5,833,537**		**$ 637,230**		**$6,470,767[2]**	

1. Includes projects, as announced, for completion in 1986 and later.
2. Dollar total includes estimated $1,018,000,000 for projects to be completed in 1986 and after ($977,000,000 production; $41,000,000 environmental).

Regions are as follows:
New England: Maine, Vt., N.H., Conn., R.I., Mass.
Mid-Atlantic: N.Y., N.J., Pa.
East North Central: Wis., Mich., Ill., Ind., Ohio
West North Central: N.Dak., S.Dak., Nebr., Kans., Minn., Iowa, Mo.
South Atlantic: Del., Md., W.Va., Va., N.C., S.C., Ga., Fla.
East South Central: Ky., Tenn., Miss., Ala.
West South Central: Okla., Texas, Ark., La.
Mountain/Pacific: Wash., Ore., Calif., Alaska, Idaho, Nev., Mont., Wyo., Utah, Ariz., Colo., N.Mex.

and a 215,000-tpy unit for Union Camp at Eastover, S.C.

Also targeted for a 1984 startup is a tissue machine for Fort Howard Paper Co. in Green Bay, Wis. Two additional tissue machines have been announced: one for Crown Zellerbach at South Glens Falls, N.Y., to startup in the second-half of 1985 and one for Fort Howard at Muskogee, Okla., due to come online in 1986.

THE BIG SPENDERS. Reflecting the great investment involved in building a greenfield mill, the three largest spenders reported in the P&P 1983-85 survey are the three U.S. companies engaged in new mill construction—Champion, Great Northern and Union Camp. This is the second year in a row that Champion is the leader in reported spending programs. Its $733-million budget includes the new machine at Courtland, Ala., as well as the upcoming pulp mill at Quinnesec, Mich. The Leaf River pulp mill at New Augusta, Ga., puts Great Northern in the No. 2 spot, with $600 million. And Union Camp checks in at No. 3 with $591 million, mostly for the Eastover, S.C., mill.

International Paper Co. has reported plans to spend $540 million, the bulk of this for conversion of the Georgetown, S.C., mill to bleached pulp and white paper. A new paper machine and major modification of the Camas, Wash., mill is responsible for Crown Zellerbach's No. 5 position, with $454 million (not including the five-year, over-$300-million program to expand and strengthen commercial tissue business, details of which have not been announced). And Scott Paper, in the No. 6 spot, is spending most of its reported $435 million for woodyard and power improvements at Mobile, Ala.

GREENFIELD MILLS—PROJECTS IN U.S.

UNDER CONSTRUCTION OR STARTED UP IN 1983	STARTUP
Champion International, Quinnesec, Mich. 265,000-tpy bleached hardwood kraft pulp mill	1986
GNN/Leaf River Forest Products, New Augusta, Miss. 350,000-tpy bleached kraft pulp, hardwood and softwood	1984
Union Camp Corp., Eastover, S.C. 215,000-tpy white paper mill*	1984

PROPOSED (NO DATE)

Augusta Kraft Co., Augusta, Ga.
262,500-tpy kraft linerboard mill

Boise Cascade, S.C.
Proposed pulp/paper complex, possibly start with 800-tpd bleached kraft

Carolina Forest Industries, Bennetsville, S.C.
Proposed two-machine, 1,500-tpd newsprint mill

Champion International, Halifax, N.C.
Proposed bleached pulp/paper complex

Champion International, Jasper, Texas
Studies for possible mill, unbleached or possibly bleached

Georgia Kraft, Elberton, Ga.
Site for possible 1,300-tpd linerboard mill

Grenada Paper Co., Grenada, Miss.
Proposed 215,000-tpy TMP/newsprint mill

Independent Kraft Corp., Tuscaloosa, Ala.
Proposed 280,000-tpy kraft linerboard mill; hoped for 1985 start*

Inland Container, Ontario, Calif.
Feasibility studies for recycled linerboard mill

Kimberly-Clark, southwest U.S.
Reported study for pulp mill to supply disposable-diaper pulp

Sunbelt Forest Products Corp., Boligee, Ala
Proposed 215,000-tpy newsprint mill

NEW PAPER MACHINES IN U.S.

UNDER CONSTRUCTION OR STARTED UP IN 1983	STARTUP
Abitibi/Augusta Newsprint, Augusta, Ga. 226,000-tpy, 336-in.-trim, 4,000-fpm Valmet—newsprint	1983
Bird & Son, Charleston, S.C. 18,000-tpy, 120-in.-trim, 400-fpm Sandy Hill—fiberglass mat	1983
Champion International, Courtland, Ala. 140,000-tpy, 228-in.-wire, 2,800-fpm Beloit—uncoated free sheet	1983
Crown Zellerbach, Camas, Wash. 160,000-tpy, 276-in.-trim, 2,500-fpm Beloit—uncoated free sheet	1984
Fort Howard, Green Bay, Wis. No. 10 machine, 250-tpd twin-wire—tissue	1984
Genstar Stone Products, Ennis, Texas 25,000-tpy, 165-in.-wire, Sandy Hill—fiberglass mat	1983
Tamko Asphalt Products, Joplin, Mo. 20,000-tpy, Sandy Hill unit—fiberglass mat	1983
Union Camp, Eastover, S.C. 215,000-tpy, 372-in.-wire, 3,200-fpm Voith—uncoated free sheet	1984

ANNOUNCED, WITH STARTUP DATE	DATE
Crown Zellerbach, South Glens Falls, N.Y. High-speed machine—tissue	1985
Fort Howard, Muskogee, Okla. No. 4 machine—tissue	1986
Independent Kraft, Tuscaloosa, Ala. 280,000-tpy, 256-in.-trim unit (1985?) —linerboard	1985

PROPOSED (NO DATE)

Blandin Paper, Grand Rapids, Minn.
Proposed 190,500-tpy machine—lightweight coated

Boise Cascade, International Falls, Minn.
Study for new machine on hold—uncoated free sheet

Chesapeake Corp., West Point, Va.
Proposed 318,000-tpy machine (for 1985?) —linerboard

Georgia-Pacific, Port Hudson, La.
Proposed 138,000-tpy machine—uncoated free sheet

Longview Fibre, Longview, Wash.
No. 12 paper machine—lightweight kraft

Philip Morris/Wisconsin Tissue, Menasha, Wis.
Studying feasibility of new No. 4 machine—tissue

Potlatch/Cypress Bend, McGehee, Ark.
Proposed second board machine—solid bleached board

St. Regis Corp.
Studying potential locations for new unit—lightweight coated

Southeast Paper Mfg., Dublin, Ga.
Proposed 160,000-tpy machine—recycled newsprint

Westvaco, Covington, Va.
Rumored new board machine—solid bleached board

Westvaco, Ky. or Md. mill
Reported new 150,000-tpy unit—uncoated free sheet

Weyerhaeuser, Columbus, Miss.
Addition of two machines postponed—uncoated free sheet, coated groundwood

CANADA

Emphasis on pulping, upgrades—biggest programs in eastern regions

■ Spending plans by Canadian pulp and paper mills have been seriously impacted by the weak overseas markets that prevailed in 1982 and into the first half of 1983, affecting its major export products of newsprint and market pulp. Recent price increases and reported returns to profit-making operations in mid-1983 hold out hope for a happier economic climate in 1984. Canadian spending plans reported in the current *P&P* survey total C$3.6 billion (lowest since the 1980 survey) and include $502 million for projects to be completed in 1986 and later. Actual spending in 1983, excluding repair spending, was reported by Statistics Canada at C$1.02 billion, a 42% drop from the 1982 level.

QUEBEC OUT IN FRONT. Mills in the province of Quebec report planned expenditures of C$1.4 billion, 40% of Canada's total and substantially outranking Ontario's industry for the first time in five years (since *P&P*'s 1979 survey). Interestingly, the spending plans for Quebec comprise many smaller projects at many different mills and include very few big projects. The survey lists just three programs expected to cost C$100 million or more: $131 million at Donohue Inc.'s Clermont mill; $179 million for James Maclaren Industries Inc. at Masson; and $100 million by Reed Paper Inc. at Quebec City.

Ontario, however, is not far behind its rival province, reporting planned expenditures of $1.1 billion, 31% of the Canadian total. However, more than half of Ontario's reported spending is allocated to just two major expansion projects: E.B. Eddy Forest Products Ltd. at Espanola, and Great Lakes Forest Products Ltd. at Dryden..

Most heavily impacted by the recessionary economy is western Canada. British Columbia, plagued with weak lumber and pulp and paper markets plus high costs, reports spending plans of only $255 million—whereas a year ago the expectation was $995 million.

COMPANY SPENDING PLANS. Despite the economic restraints, ten Canadian pulp and paper firms plan to spend upward of C$100 million on expansion/modernization programs in the 1983-85 period (with three of the ten including projects to be completed in 1986 and later). Leading this select group is Consolidated-Bathurst Inc., which reports programs totaling $544 million. Great Lakes Forest Products, with $384 million, is in second place; and E.B. Eddy, with $321 million, is in the third spot.

Expansion programs planned for the 1983-85 period for seven existing mill sites are reported to cost $100 million and higher. Most expensive single mill-site project is the $350 million being spent by Great Lakes at Dryden, Ont. Next in line is the $249 million for Eddy Forest Products at Espanola, Ont. The four other over-$100-million programs are for Fraser Inc. at Atholville, N.B. ($170 million); CIP Inc. at Dalhousie, N.B. ($147 million), Consolidated-Bathurst at Bathurst, N.B. ($122 million); and Reed at Quebec City ($100 million).

SPENDING BY CATEGORIES. Pulp production is of prime importance to the Canadian industry and repeatedly represents 35% or more of the planned expenditures reported in the *P&P* survey. The C$1.2 billion in the 1984 survey is 36% of the Canadian total.

The major change in the current survey is the shift

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1983-85+[1]
BY REGIONS AND BY TYPE OF FACILITY (C$000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
Maritimes	$ 14,280	11%	$ 368,828	30%	$ —	0%	$ 73,500	15%	$ 159,260	44%	$ 69,416	9%
Quebec	45,742	37%	370,434	30%	50,000	23%	253,389	53%	124,881	35%	302,465	40%
Ontario	57,071	46%	455,865	37%	95,000	44%	118,147	25%	51,335	14%	300,427	40%
Central	2,000	2%	12,450	1%	—	0%	14,000	3%	6,400	2%	22,920	3%
West	5,250	4%	27,280	2%	70,000	33%	16,681	4%	19,754	5%	59,471	8%
Total	**$ 124,343**		**$1,234,857**		**$ 215,000**		**$ 475,717**		**$ 361,630**		**$ 754,699**	

	ENVIRONMENTAL QUALITY SPENDING						TOTALS:					
	WATER		AIR		WASTE/UNSPEC.		PRODUCTION		ENVIRONMENT		GRAND TOTAL	
Maritimes	$ 12,300	5%	$ 18,300	10%	$ —	0%	$ 685,284	22%	$ 30,600	7%	$ 715,884	20%
Quebec	139,950	65%	122,900	65%	3,383	67%	1,146,911	36%	266,233	65%	1,423,144	40%
Ontario	34,090	16%	12,700	7%	1,700	33%	1,077,845	34%	48,490	12%	1,126,335	31%
Central	—	0%	135	0%	—	0%	57,770	2%	135	0%	57,905	2%
West	29,760	14%	35,090	18%	—	0%	198,436	6%	64,850	16%	263,286	7%
Total	**$ 216,100**		**$ 189,125**		**$ 5,083**		**$3,166,246**		**$ 410,308**		**$3,576,554[2]**	

1. Includes projects, as announced, for completion in 1986 and later.
2. Dollar total includes estimated C$502,000,000 for projects to be completed in 1986 and later ($385,000,000 production; $117,000,000 environmental).

Note: Tabulations are based on these regional divisions: "Maritimes" is New Brunswick, Newfoundland, and Nova Scotia; "Central" is Manitoba and Saskatchewan; "West" is British Columbia and Alberta; Ontario and Quebec are treated individually.

from new paper machine programs to rebuilds and modifications of existing machines. Machine modification projects, reported at $476 million, represent 14% of Canada's spending plans; a year ago this was 5% of the total. And spending for new machines has dropped to 5% from its previous 12%.

Percentage of total spending by Canadian mills for other industry categories remains within one or two points of previous surveys. Total outlays for production-related projects in the 1983-85 survey are 88% (vs 89% a year ago) and environmental projects rose to 12% (from 11% last year).

NEW MILLS AND MACHINES. No new mill started up in Canada in 1983 and none are under construction as of end-1983. Some proposed projects could still come to fruition, but the heady days when two or three new mills (or more) could be counted on to come online each year appear to be very much past history.

The Brazeau Timber Development Area in central Alberta is the locale for most of the mill proposals now being considered. The provincial government is endeavoring to develop this timberland. The most promising of the greenfield mill proposals appears to be that for a joint venture of B.C. Forest Products and Alberta Energy Co. for a softwood kraft pulp mill at Whitecourt, Alta. (This would replace the postponed TMP/newsprint mill that was to have been built by BCFP at Hurdy. Two other proposals have been made to build mills in the Brazeau area—a nearly-C$1-billion project, 15-year program at Rocky Mountain House by Northwood Forest Industries Ltd./Atco; and a modest pulp and paper mill by Makin Project of Red Deer. All await the government's decision.

The only new mill proposal in eastern Canada—the joint venture of the Quebec-owned forest agency Rexfor with papermaker F.F. Soucy Inc. for a TMP/newsprint mill at Matane, in northern Quebec—received a major setback in early 1983 when the Canadian federal government failed to provide expected financing and Soucy withdrew from the project.

Two new paper machines started up at Canadian mills in 1983—a 192,000-metric-tpy newsprint unit at the Iroquois Falls, Ont., mill of Abitibi, and the 80,000-

LATE NEWS BREAK:

Add $1.2 billion to Canadian total

On Dec. 9, as this issue was being readied to print, Domtar Inc. announced a six-year modernization program for its Windsor, Que., and Cornwall, Ont., paper mills. At Windsor, a C$773-million project includes two new paper machines to replace four existing units and raise capacity to 318,000 metric tpy. At Cornwall, a $139-million program will center on modernizing existing machines.

At the same time, Western Forest Products Ltd. in British Columbia received approval for a limited partnership designed to raise funds for needed capital improvements at its two pulp mills—the kraft pulp mill at Squamish, B.C., and dissolving sulfite facility at Port Alice, B.C. It is expected that the required $248 million will be raised and construction on the mill modifications (halted in 1982) can be resumed early in 1984.

Unfortunately, these projects could not be included in the spending tabulations in this summary. The additional $1.2 billion brings Canada's overall proposed total spending to $4.7 billion. Most of the newly announced projects will be completed in 1986 or later.

SUMMARY OF CANADIAN PROJECTS—REPORTED EXPENDITURES 1983-85[1] BY PROVINCES (C$000)

PROVINCE	PRODUCTION	ENVIRONMENTAL	TOTAL
Alberta	C$ 3,400	C$ 4,900	**C$ 8,300**
British Columbia	195,036	59,950	**254,986**
Manitoba	35,000	135	**35,135**
New Brunswick	460,334	24,300	**484,634**
Newfoundland	49,200	—	**49,200**
Nova Scotia	175,750	6,300	**182,050**
Ontario	1,077,845	48,490	**1,126,335**
Quebec	1,146,911	266,233	**1,413,144**
Saskatchewan	22,770	—	**22,770**
Total	**C$3,168,246**	**C$410,308**	**C$3,576,554[2]**

1. Includes projects, as announced, for completion in 1986 and later.
2. Dollar total includes an estimated C$502,000,000 for projects to be completed in 1986 and after (C$385,000,000 production; $117,000,000 environmental).

TOP SPENDERS IN CANADA

Companies which report capital spending plans of C$100,000,000 or more, including both production and environmental programs

	1983-85	1982-84
Consolidated-Bathurst	C$543,961,000*	C$371,569,000
Great Lakes Forest Products	383,700,000	379,500,000
E.B. Eddy Forest Products	320,900,000*	298,853,000*
Abitibi-Price	299,250,000	345,050,000
Maclaren Industries	255,271,000	104,013,000
CIP Inc.	211,100,000	209,300,000
Fraser Inc.	170,000,000	228,150,000
Domtar Inc.	166,500,000	213,610,000*
Ontario Paper	144,891,000*	345,983,000*
Reed Paper	120,000,000	120,000,000*

*Includes programs for completion beyond 3-year period indicated.

Total cost of multiyear project is assigned to year of startup.

tpy uncoated free-sheet machine at Island Paper Mills (jointly owned by MacMillan Bloedel Ltd. and Fraser) in New Westminster, B.C.

Two machine are heading for 1984 startup—a 122,000-tpy uncoated free-sheet unit for Great Lakes at Dryden, Ont., and a 36,000-tpy tissue machine for Scott Paper Ltd. at New Westminster, B.C.

One machine is scheduled to come online in 1985—a 170,000-tpy newsprint unit for Maclaren at Masson, Que. The Maclaren machine will replace two existing units and also increase mill capacity by 10,000 tpy.

Installations of several new paper machines have been indefinitely postponed from the originally announced startup date--these include newsprint machines for Abitibi at Alma, Que., Great Lakes at Dryden, Ont., and Kruger Inc. at Trois Rivières, Que. ■

GREENFIELD MILLS— PROJECTS IN CANADA

(metric tons)

PROPOSED (NO DATE)

B.C. Forest Products, Whitecourt, Alta.
Studying feasibility of softwood kraft pulp mill in joint venture with Alberta Energy Co.; project would replace planned 175,000-tpy TMP/newsprint mill

Doman Industries, Nanaimo, B.C.
Long-proposed 175,000-tpy TMP mill; end-1983, project on hold

Makin Project Ltd., Red Deer, Alta.
Long-proposed 85,000-tpy CMP/43,000-tpy printing/writing paper mill; provincial government decision on allocation of management blocks in Brazeau Timber Development has not been made

Northwood/Atco, Rocky Mtn. House, Alta.
Proposed 15-year program for 150,000-tpy kraft pulp mill, TMP mill, 175,000-tpy paper machine; later more CMP and paper machines; project dependent on provincial government decision on management blocks in Brazeau Timber area

NEW PAPER MACHINES IN CANADA

(metric tons)

UNDER CONSTRUCTION OR STARTED UP IN 1983	**STARTUP**
Abitibi-Price, Iroquois Falls, Ont. 192,000-tpy, 352-in.-trim, 3,500-fpm Valmet—uncoated free sheet	**1983**
Great Lakes Forest Products, Dryden, Ont. 122,000-tpy, 194-in.-trim, 3,500-fpm Valmet—newsprint	**1984**
Maclaren Industries, Masson, Que. 170,000-tpy, 300-in.-trim, 4,500-fpm Beloit—newsprint	**1985**
MB/Island Paper Mills, New Westminster, B.C. 80,000-tpy, 159-in.-trim, 3,000-fpm Valmet—uncoated free sheet	**1983**
Scott Paper, New Westminster, B.C. 36,000-tpy, 185-in.-trim, 5,000-fpm KMW—sanitary tissue	**1984**

PROPOSED (NO DATE)

Abitibi-Price, Alma, Que.
Proposed machine to replace two existing—newsprint

Great Lakes Forest Products, Dryden, Ont.
Possible 175,000-tpy machine—newsprint

Kruger Inc., Trois Rivières, Que.
Proposed No. 10, 172,000-tpy, 300-in. Beloit (in storage) —newsprint

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN CANADA

(over $35,000,000 at an existing mill site)

Abitibi-Price, Grand Falls, Nfld.	C$49,400,000
Abitibi-Price, Iroquois Falls, Ont.	132,100,000*
Abitibi-Price, Beaupre, Que.	87,000,000
Bowater Mersey, Liverpool, N.S.	71,000,000
CIP Inc., Dalhousie, N.B.	146,600,000
Consolidated Bathurst, Bathurst, N.B.	122,000,000
Consolidated Bathurst, Grand'Mère, Que.	41,271,000†
Consolidated Bathurst, New Richmond, Que.	36,100,000†
Consolidated Bathurst, Shawinigan, Que.	80,590,000
Consolidated Bathurst, Trois Rivières, Que.	41,500,000†
Consolidated Bathurst, Ville de la Baie, Que.	74,000,000†
Domtar, Donnacona, Que.	46,600,000
Domtar, Red Rock, Ont.	44,500,000
Eddy Forest Products, Espanola, Que.	249,000,000
Fraser Inc., Atholville, N.B.	170,000,000
Great Lakes Forest Products, Dryden, Ont.	350,000,000*
James River-Marathon, Marathon, Ont.	95,000,000
MB/Island Paper, New Westminster, B.C.	57,000,000*
Nova Scotia Forest Products, Pt. Tupper, N.S.	46,200,000
Ontario/Q.N.S. Paper, Baie Comeau, Que.	86,162,000†
Reed Paper, Quebec City, Que.	100,000,000*
Scott Maritimes, Abercrombie Point, N.S.	58,550,000
Scott Paper, New Westminster, B.C.	63,000,000*
Spruce Falls/K-C, Kapuskasing, Ont.	88,200,000
Tembec, Temiskaming, Que.	43,225,000†

*Includes new paper machine (also in listing of New Machines).
†Includes projects for completion in 1986 and later.

Data in this table necessarily omits expansion projects for which cost information has not been released.

DETAILED MILL-BY-MILL LISTINGS OF CAPITAL SPENDING PROGRAMS

Pulp & Paper's exclusive survey of capital spending programs for 1983-85 by companies and at individual mill locations in the U.S. and Canada is available as a separate booklet (and is not published in the magazine).

The listings show programs for new mills and new machines, rebuilds and modernizations, plant improvements, with specifics of equipment ordered, suppliers, and price (where reported). Separate listings show projects for environmental control.

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Chlorine production and prices on the upswing

By BARRY SHOCKETT

The strong growth by the construction and automotive industries in 1983 led to a recovery in demand for polyvinyl chloride (PVC) which, in turn, sparked a sharp increase in chlorine requirements for ethylene dichloride (EDC) production. Chlorine output was up almost 7.5% at the end of September 1983, compared with the 1982 period.

U.S. statistics for chlorine (000 short tons)

	1980	1981	1982	1983e
Capacity (estimate)	14,235	14,300	14,500	12,700
Production	11,421	10,558	8,907	9,900
Imports	166	181.5	217	212
Exports	117	50.5	35	61
Apparent consumption	11,470	10,689	9,089	10,050
Pulp and paper	1,500	1,400	1,200	1,300

Sources: Bureau of Census, U.S. Dept. of Commerce; *Pulp & Paper* and industry estimates.

Canadian statistics for chlorine (000 short tons)

	1980	1981	1982	1983e
Capacity	1,641	1,652	1,680.5	1,680.5
Production	1,435	1,424	1,360	1,488
Imports	42.5	27	23.5	46
Exports	166	181.5	217	212
Apparent consumption	1,311.6	1,269.5	1,166.5	1,322
Pulp and paper	612.5	562	507	529

CHLORINE

UNITED STATES

Uses: Chlorine's major use by the pulp and paper industry is for bleaching kraft and sulfite pulps.

Demand: In 1983 the pulp and paper industry used an estimated 1.3 million tons of chlorine (13% of total demand), compared with 1.2 million tons the year before. The largest end use is for EDC production.

Sources: At least 25 companies in the U.S. produce chlorine and caustic. The major chlorine producers (in descending order of nameplate capacity) are Dow Chemical, PPG Industries, Diamond Shamrock, Olin, Occidental Chemicals, Vulcan Materials, Georgia-Pacific, Convent Chemical, and Pennwalt. Imports, all from Canada, were an estimated 212,000 tons in 1983, down about 5,000 tons from 1982.

Availability: Despite the closure of some plants over the past year or so, there is still sufficient capacity to deal with increased chlorine demand. However, the long caustic situation in 1983 reduced chlorine supply for most of the second half of the year. 1983, market to tight; 1982, market; 1981, market; 1980, market; 1979, tight to very tight; 1978, market.

Pricing: Five consecutive quarterly increases to chlorine's selling prices since September 1982 have totaled almost $100. Current posted chlorine tags vary with producer and shipping point from $145/ton to $180/ton. Pricing history: 1983, $145-$180/ton, f.o.b. works, freight equalized; 1982, $145/ton; 1981, $145/ton; 1980, $145/ton; 1979, $135-$150/ton; 1978, $135-$145/ton.

Forecast: Over the long term, pulp mill chlorine use will gradually decrease as chlorine dioxide substitution increases. However, 1984 pulp mill consumption should match the 1.4 million tons consumed in 1981 if pulp production continues to rise. By the end of August 1983, market pulp output was 6.4 million tons on an annualized basis (up 8.7% over 1982).

CANADA

Uses: Chlorine's major use by the pulp and paper industry is as a bleaching agent in kraft and sulfite pulp mills. Additional quantities are consumed in onsite hypochlorite makeup.

Demand: An estimated 529,000 tons of chlorine were required by the pulp and paper industry in 1983, an increase of 22,000 tons from 1982. The industry's share of total demand was about 37.5% in 1983 vs 56% in 1979. It had increased slightly in 1982 to 40.5% from 39% in 1981. The largest end use last year was in the production of EDC, which made up 42% of the total.

Sources: Major merchant producers include (in descending order of nameplate capacity) Dow Chemical Canada, C-I-L, Canadian Occidental Petroleum, Stamchem Div., PPG Industries, and FMC Chemicals. The four captive producers are Canso Chemical, Great Lakes Forest Products, Prince Albert Pulp (Saskatoon Chemicals), and St. Anne Chemical.

Availability: Although domestic demand was up in 1983 and the industry operating rate was over 88%, no shortages were anticipated in the immediate future. 1983, market; 1982, market; 1981, market; 1980, market; 1979, tight; 1978, tight.

Pricing: Two chlorine price hikes took place in 1983—Jan. 1 and July 1—the most recent upped list to $344.75/ton. Pricing history: 1983, $308.45-$344.75/ton, bulk, f.o.b. works; 1982, $254-$281/ton; 1981, $225-$254/ton; 1980, $195-$225/ton; 1979, $163-$195/ton; 1978, $145-$163/ton.

Forecast: No further price hikes for chlorine were slated in early 1984. Over the long term, pulp mill chlorine usage will be reduced by chlorine dioxide replacement. If pulp markets continue to increase, mill chlorine consumption could reach the 540,000-ton level in 1984. By the end of September 1983, bleached kraft output was 9.6% ahead of the comparable 1982 period.

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